Aviation
Occurrence Reports

AVIATION OCCURRENCE REPORTS

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Cat. No. TU2-3 / 9E

FOREWORD

90-07042/

AVIATION OCCURRENCE REPORTS

On March 29, 1990, the Canadian Transportation Accident Investigation and Safety Board took over the responsibilities of the Canadian Aviation Safety Board (CASB). The Aviation Occurence Reports contained in this issue were completed by the CASB prior to the changeover. The responsibility for making these reports public now rests with the new transportation safety board.

In accordance with the CTAISB Act, part of the Board's objective is to report publicly on its investigations, on the related findings, and on any recommendations designed to eliminate or reduce safety deficiencies.

The Aviation Occurrence Reports publication contains reports on CASB investigations, findings, and recommendations adopted by the Board and occurrence briefs. The sole intent in providing this information is to advance aviation safety. It is not the object of the Board to determine or apportion any blame or liability in connection with aviation occurrences.

This publication contains reports of aviation occurrences, in Canada, involving Canadian or foreign-registered aircraft. Anyone wanting to employ the Aviation Occurrence Reports for purposes other than advancing aviation safety could find the information incomplete.

This publication is also available in French.

A limited number of copies of this publication are retained and are available from:

Canadian Transportation Accident
Investigation and Safety Board
P.O. Box 9120 Alta Vista Terminal
Ottawa, Ontario
K1G 3T8

Cette publication est également disponible en français.

On peut obtenir des exemplaires de la présente publication en nombre limité auprès du:

Bureau canadien d'enquête sur les accidents
de transport et de la sécurité des transports
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EXPLANATORY NOTES

TYPES OF REPORTS

The CTAISB currently produces four types of occurrence reports: there are three investigation report formats and the brief. the most common investigation report format is the summary report which summarizes the details of the investigation in one or two pages. Intermediate reports are somewhat longer and more detailed. For both these types, the complete public report is reproduced in this publication. More factual information is available on summary and intermediate reports and can be obtained by contacting the CTAISB and referencing the report number. A small number of investigations (generally 15 to 20 per year) result in International Civil Aviation Organization (ICAO) format reports. For the latter type of report, only the synopsis and the conclusions and recommendations sections of the report are included in this publication. The full report can be obtained by contacting the CTAISB and referencing the report number (which is included with the synopsis). An aviation occurrence brief is a short narrative history of the flight and occurrence. It includes pertinent information based on a report by the pilot or operator of the aircraft. Laboratory reports, if laboratory analysis has been carried out, are available for all three categories of reports and can be obtained in the same manner.

GROUPING OF REPORTS

For ease of reference, the reports in this publication are grouped by broad category of aircraft type and by type of operation within each group. the reports are then presented chronologically (by the date of the occurrence) within each subgroup.

For fixed-wing conventional aircraft, the subgroup is Public Transportation. This includes scheduled, other unit toll, and charter operations. Note that this subgroup is further divided into occurrence involving (i) aircraft of 5 700 kg (12,500 lb) or over and (ii) aircraft under 5 700 kg (12,500 lb). The second subgroup is Commercial Training. This includes licensed flying clubs and commercial specialty training (commercial licence classes 6 and 7, respectively). All other types of fixed-wing aircraft commercial operations are grouped under Other Commercial Operations. The Private Aircraft subgroup includes all privately registered aircraft, both personal and corporate. It is further subdivided according to type of landing gear. The final subgroup contains occurrences involving state-owned aircraft.

For the rotary-wing category, there are fewer aircraft and fewer occurrences. Thus, only three subgroups are used, viz. Commercial, Private, and State.

The final category contains reports and briefs for all other types. This includes amateur-built aircraft, ultralights, gliders, balloons, etc.

CONTENTS OF SUMMARY REPORTS AND INTERMEDIATE REPORTS

Information on Aircraft:

The first block of each report identifies the type of aircraft involved in the occurrence, the model, the registration, the location, and the date of the occurrence; for commercially operated aircraft, the operator is also identified.

Occurrence Report Number:

The second block commences with the occurrence report number (any queries to the CTAISB should carry this reference). The first two numbers identify the year of the occurrence, the first letter identifies the CTAISB office that conducted the investigation ('A' - Atlantic, 'Q' - Quebec, 'O' - Ontario, 'C' - Central, 'W' - Western, 'P' - Pacific, 'H' - Head Office). The first number after the letter identifies the year of the decade of the occurrence. This block also contains information on the type of investigation (a correspondence investigation is one in which the site of the occurrence was not visited by a CTAISB investigator), the time of the occurrence, the type of operation, the extent of damage to the aircraft, and the type of licence held by the pilot.

Pilot Hours:

This block indicates the total number of hours the pilot had acquired on all types of aircraft, the total number of hours on type, and number of hours flown in the last 90 days (in total and on type).

Injuries:

The injuries sustained by the crew, passengers, or others are classified as Fatal, Serious, or Minor/None (See Definitions).

Summary Report Narrative:

The narrative summarized the history of the flight, pertinent factual information and analysis. The narrative is divided into two parts:

(a) the factual information or a description of what happened, which begins with a description of the history of the flight as close as possible to the occurrence, followed by the pertinent information; and

(b) an analysis of why the occurrence happened.

Reported Circumstances: (Briefs only)

The narrative summarizes the pertinent information based on a report by the pilot or operator of the aircraft.

Findings: (Reports only)

The Board's findings from an investigation are grouped under two subheadings as follows:

Cause-Related Findings: Any element of the occurrence, found during the investigation which, if removed, would have prevented the occurrence, or, if removed, would have avoided or reduced damage to property and people.

Other Findings: Information, discovered during the investigation of an occurrence, which is not cause related but has the potential to enhance or degrade aviation safety.

Safety Action:

For all aviation occurrence investigations, relevant data are recorded to facilitate statistical analysis and the identification of system-wide safety deficiencies through safety studies. In cases where an individual occurrence investigation leads to significant safety action being taken, that action is included in the public report immediately after the findings.

DEFINITIONS

(Extracted from the Canadian Aviation Safety Board Act/Regulations)

"AVIATION OCCURRENCE"

(a) any accident or incident associated with the operation of aircraft, and

(b) any situation or condition that the Board has reasonable grounds to believe could, if left unattended, induce an accident or incident as described in paragraph (a).

"ACCIDENT"

"ACCIDENT" means any aviation occurrence where, at any time during the period commencing when the first person boards an aircraft for the purpose of flight and ending when the last person disembarks from the aircraft after the flight,

(a) a person other than a stowaway, sustains a serious injury or fatal injury, that is not self-inflicted or inflicted by another person or caused by natural causes, as a result of that person

  i) being in the aircraft,

  ii) coming in direct contact with any part of the aircraft, including any part that may have become detached from the aircraft, or

  iii) being directly exposed to the jet blast of the aircraft,

(b) the aircraft sustains damage or structural failure adversely affecting the structural strength, performance or flight characteristics of the aircraft and normally requiring major repair or replacement of any affected component part, other than damage or failure that is limited to

  i) the engine, its cowling, or its accessories,

  ii) the propellers, wing tips, antennae, tires, brakes or fairings, or

  iii) small dents or puncture holes in the aircraft skin, or

(c) the aircraft is missing or is completely inaccessible.

"SERIOUS INJURY"

"SERIOUS INJURY" means an injury that is sustained by a person in an accident and that

(a) requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was sustained,

(b) results in a fracture of any bone, other than a simple fracture of the nose or of any fingers or toes,

(c) involves lacerations that cause severe haemorrhage or nerve, muscle or tendon damage,

(d) involves injury to any internal organ, or

(e) involves second or third degree burns, or any burns affecting more than five per cent of the body surface.

"INCIDENT"

"INCIDENT" means an aviation occurrence, other than an accident, that affects or could affect the safe operation of an aircraft. Incidents can be reported to the CTAISB through mandatory or voluntary reporting mechanisms.

According to the CTAISB regulations a "reportable incident" means any incident involving an aircraft with a maximum certified take-off weight greater than 5 700 kg where

(a) an engine fails,

(b) smoke or fire occurs, other than an engine fire that is contained within the engine and does not result in engine failure or damage to other component parts of the aircraft,

(c) difficulties in controlling the aircraft in flight are encountered due to any aircraft system malfunction, weather phenomena, wake turbulence, operations outside the approved flight envelope, or uncontrolled vibrations,

(d) the aircraft fails to remain within the intended landing or take-off area, lands with one or more landing gear retracted, or drags a wing tip or engine pod,

(e) any crew member is unable to perform his flight duties as a result of incapacitation,

(f) decompression, explosive or otherwise, occurs that necessitates an emergency descent,

(g) a fuel shortage occurs that necessitates a diversion or requires approach and landing priority at the destination of the aircraft,

(h) the aircraft is refuelled with the incorrect type of fuel or contaminated fuel that is undetected prior to departure from the ramp,

(i) a collision or risk of collision with any other aircraft or with any vehicle, terrain or obstacle occurs, including a collision or risk of collision that may be related to air traffic control procedures or equipment failures,

(j) a flight crew member declares an emergency or indicates any degree of emergency that requires priority handling by an air traffic control unit or the standing by of a crash, fire fighting or rescue services, or

(k) toxic gases or corrosive materials leak from any cargo aboard the aircraft.

BRITISH AIR TOURS
BOEING 747 G-BMGS
SYDNEY, NOVA SCOTIA 200 mi E
29 MARCH 1987

REPORT NUMBER: 87-A74921 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0145 ADT
OPERATION: International Charter
DAMAGE: Nil
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	16
PASSENGERS	-	-	462

SUMMARY REPORT:

While the aircraft was in cruise flight, the forward cargo-hold fire-warning system activated. The captain activated the fire extinguisher system and diverted to Halifax, Nova Scotia, where the aircraft landed safely. Inspection of the cargo holds revealed that it was a false alarm.

Operators have reported many nuisance smoke/fire detection warnings in the Boeing 747 lower lobe cargo compartments. Many of the warnings have resulted in flight delays, diverting of flights, fuel dumping, and discharging of the fire bottles. Five occurrences of smoke/fire detection warnings have recently been investigated by the CASB. Three of the warnings resulted in flight diversions, and one resulted in an emergency evacuation. In all cases, there was no evidence of fire. Most false warnings occur in aircraft fitted with a single-wire loop detection system.

Both British Airways and British Air Tours have experienced many false warnings with single-wire loop detection systems. The equipment was checked after the warnings and found serviceable. An exact cause for the false indications could not be determined; however, high moisture levels in the compartments were suspected. The false alarms seemed to have occurred when cargos such as bulk fruit or other loads which had a high moisture content were carried.

Air Canada had three false alarms in 1982 and one in 1987 with single-wire loop detection systems. The 1982 experience indicated that the amplifiers were adjusted to be too sensitive. A more stringent pre-installation inspection of the equipment was introduced which corrected the problem.

Boeing offers a non-mandatory conversion from a single-wire loop detection system to a dual-wire loop detection system designed to correct the problem of frequent false warnings. The incident aircraft had not been converted.

CONCLUSIONS:

Findings:
1. The cargo-hold fire warning system activated in flight.

2. Other Boeing 747 aircraft have reported false, cargo-hold fire warnings, necessitating flight delays, diverting of flights, fuel dumping, and discharging of fire bottles.

3. Boeing Aircraft Company offers a non-mandatory modification which addresses the problem of false fire warnings in B747 cargo holds.

Causes:
The cargo-hold fire warning system activated for undetermined reasons.

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CANADAIR CL600 E-IGPA
TORONTO/LESTER B. PEARSON INTERNATIONAL AIRPORT, ONTARIO
06 JULY 1987

BRIEF NUMBER: 87-O/74917 (Incident)
LOCAL TIME: 1538 EDT
OPERATION: Private Training
DAMAGE: Nil
PILOT LICENCE: Airline Transport

PILOT HOURS:

	CAPTAIN/ CHECK-PILOT		PILOT/TRAINEE	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	13,445	498	13,000	0
LAST 90 DAYS	33	33	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The trainee pilot, seated in the left seat, was attempting his first take-off in the CL600 aircraft. The aircraft began to swing to the left, and the swing was not corrected before the aircraft ran off the runway. The aircraft was not damaged.

The nosewheel steering is accessible only to the pilot in the left seat. The steering had the maximum allowable play in the system when checked. A non-mandatory modification to improve ground steering control had not been incorporated in this aircraft.

* * * * *

RISK OF COLLISION BETWEEN:
DELTA AIR LINES
LOCKHEED L-1011 N1739D and
CONTINENTAL AIRLINES
BOEING 747-200 N608PE
NORTH ATLANTIC 52°14'N 34°00'W
08 JULY 1987

REPORT NUMBER: 87-A74947

DELTA FLIGHT 37

	Captain	First Officer	Second Officer
Pilot Licence	Airline Transport Pilot (USA)	Airline Transport Pilot (USA)	Flight Engineer (USA)
Total Flying Time	24,000 hr	12,000 hr	3,000 hr
Total on Type	4,200 hr	1,000 hr	850 hr
Total Last 90 Days	210 hr	110 hr	103 hr

Injuries:	Crew	Passengers	Others	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	16	156	-	172
Total	16	156	-	172

CONTINENTAL FLIGHT 25

	Captain	First Officer	Second Officer
Pilot Licence	Airline Transport Pilot (USA)	Airline Transport Pilot (USA)	Commercial (USA)
Total Flying Time	5,800 hr	3,800 hr	1,150 hr
Total on Type	1,400 hr	1,700 hr	450 hr
Total Last 90 Days	N/A	N/A	N/A

Injuries:	Crew	Passengers	Others	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	20	397	-	417
Total	20	397	-	417

HISTORY OF THE FLIGHT:

Delta Flight 37, a Lockheed L-1011, departed London's Gatwick Airport on 08 July 1987 at 1334 Coordinated Universal Time (UTC) on a scheduled international flight to Cincinnati, Ohio. Continental Flight 25, a Boeing 747-200, departed Gatwick Airport five minutes later at 1339 UTC on a scheduled international flight to Newark, New Jersey.

As both aircraft approached the oceanic boundary, Shanwick Oceanic Control Centre assigned parallel routes, separated by 60 nautical miles, for the flight across the North Atlantic. Both aircraft were assigned a pressure altitude of 31,000 feet (flight level 310).

At 30 degrees west longitude, Delta 37 began deviating to the south of its assigned track and closed laterally with Continental 25 (see Figure 1.1.). Delta 37's deviation continued until the aircraft crossed the assigned track of Continental 25. As Delta 37 crossed the track of Continental 25, the front half of Delta 37 passed beneath the rear fuselage of Continental 25 with less than 100 feet of vertical separation. Neither crew saw the other aircraft in time to take evasive action.

The near collision occurred during the hours of daylight at 1625 UTC, over the North Atlantic at lat 52°45'N, long 33°12'W.

PERTINENT INFORMATION:

When Delta 37 passed 30 degrees west, the aircraft turned left through 26 degrees. The flight log indicated that a 10-degree turn was required to maintain the desired track. The flight log also specified an elapsed time of 45 minutes for Delta 37 to fly from 30 west to 40 west. The captain used the FMS information to pass the position report at 30 degrees west. Based on this information, the estimated elapsed time to reach 40 degrees west was 61 minutes. No one in the cockpit detected the time and heading discrepancies.

Immediately after the occurrence, the captain turned his attention to regaining the correct track and reprogrammed the current "to" waypoint for 40 degrees west. By completing this procedure, the previously programmed waypoint data for 40 degrees west was erased. As a result, the captain could not confirm whether the INS had been programmed incorrectly or if it was malfunctioning.

After crossing Track D, Delta 37 continued to deviate another 20 nautical miles south before turning to regain the assigned track. The Delta crew received assistance from other aircraft crews in the area who had them in sight. Delta 37 descended 500 feet before recrossing Track D. The aircraft was back on its assigned track, Track C, just before reaching 40 degrees west.

The INS functioned normally after the occurrence. At Cincinnati, the captain entered a snag on the performance of the INS, which resulted in electronic maintenance personnel checking the equipment immediately before dispatching the aircraft. There was an ongoing check of the aircraft's INS system for several weeks after the occurrence; during this period, the equipment operated satisfactorily without any reported malfunction.

A gross navigation error is defined as a deviation of more than 25 nautical miles from the prescribed track. An examination of previous occurrences involving gross navigation errors over the North Atlantic indicates that data input errors are a factor in the majority of cases, in particular those errors involving the use of INS.

The ICAO *North Atlantic MNPS Airspace Operations Manual* makes several references to dealing with navigation difficulties. Regardless of origin of the difficulty, the manual states "ATC should be contacted" whenever navigation degradation is suspected or known.

A Federal Aviation Administration (FAA) Advisory Circular (AC 90-79 dated 7/14/80), entitled *Recommended Practices and Procedures for the Use of Electronic Long-Range Navigation Equipment*, states that ATC should be informed when a flight is experiencing navigation difficulty.

Delta's MNPS navigation error reporting procedures were contained in the Pilot's Operating Manual and were identical to those published in the ICAO *North Atlantic MNPS Airspace Operations Manual*. The *Pilot's Operating Manual* was required to be carried in the cockpit by the second officer for reference as necessary. The *Jeppesen International Manual* is carried in the cockpit and contains airways information and other pertinent information for international flight. Delta inserted special pages into their *Jeppesen International Manual*, outlining Delta's company procedures for using self-contained navigation systems, but no reference is made to MNPS navigation difficulty reporting procedures.

The navigation difficulty was not reported to ATC by either Delta 37 or Continental 25 flight crew or by any one of more than 20 flight crews who were aware of the occurrence. The crew of Continental 25, however, reported the incident to company dispatch as they approached New York.

The FAA-approved Delta international training included instruction on INS operation and cross-check procedures for transoceanic operations. Delta requires that all crew members receive this training before flying transoceanic flights. The captain and first officer must fly a return jump-seat familiarization flight. The captain must then fly a return trip with a line check airman. Both the captain and first officer had successfully completed this training program.

In London, the pilots received their flight-planning documents from Gatwick Handling Limited, the company's ground-handling agent in London. All material provided to the crew was found to be accurate and complete.

ANALYSIS:

On 08 July 1987, Delta 37 flew within 100 feet of Continental 25. Both aircraft were westbound across the North Atlantic at flight level 310. The incident occurred in airspace controlled by Gander Oceanic Area Control Centre. Delta 37, which had been assigned North Atlantic Track C, 60 nautical miles to the north of Track D, departed its track, crossed Track D, and continued to a point about 80 miles south of course before the crew began to correct back to the assigned track.

The analysis will discuss the reasons for the navigation error and why it remained undetected. This will include a discussion of crew and air traffic control procedures. Finally, the manner in which the incident was reported will be addressed.

CONCLUSIONS:

Findings:

1. The near collision resulted from an INS data input error by the Delta Flight 37 crew.

2. Delta Flight 37's crew did not follow established INS cross-checks.

3. Delta Flight 37, while at flight level 310, deviated 80 nautical miles south of its assigned track after passing 30 west.

4. Delta Flight 37 crossed the track of Continental Flight 25 which was also at flight level 310.

5. Neither aircraft crew saw the other aircraft in time to take evasive action, and the angle of closure made a visual sighting unlikely.

6. The forward fuselage of Delta Flight 37 passed beneath the rear fuselage of Continental Flight 25 with less than 100 feet of vertical separation.

7. Continental Flight 25 was maintaining its assigned track.

8. Delta 37's flight crew had limited experience in North Atlantic flying, with no crew member having more than six return trips.

9. Although cross-check procedures were contained in explicit detail in the manuals used by the crew, they

were set out in such terms and format that a mandatory requirement to cross-check at each and every waypoint may not have been clearly conveyed to aircrew.

10. The ATC clearances received and acknowledged by both aircraft were correct and, if followed, would not have resulted in a loss of separation.

11. The occurrence was not reported to ATC in a timely manner by the involved flight crews, in accordance with ICAO requirements.

12. Continental Flight 25 reported the occurrence to company dispatch, as it approached New York.

13. The estimate for Delta Flight 37 at 40 west showing a difference of 16 minutes was not challenged by ATC, nor was it required to be in the circumstances of this incident.

14. There is no direct pilot/controller communication on transatlantic flights.

15. HF communications on transatlantic flights may be subject to significant time delays.

16. About 1. 5 hours after the first occurrence, the crew of Delta Flight 37 misinterpreted an ATC clearance, and the aircraft was involved in a technical loss of separation with another aircraft.

17. The Delta 37 flight crew was certified and qualified for the flight in accordance with existing regulations.

18. The Delta 37 aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

19. No evidence was found that would indicate the Delta 37 INS was malfunctioning prior to or during the flight.

Causes:
A navigation error resulting from an INS data input error led to the near collision. The error was not detected because the crew, who were relatively inexperienced with Atlantic crossings, did not perform adequate cross-checks of the INS. The company did not provide clear direction on the INS procedures to be followed. ATC did not query the error in the crew's estimated time of arrival over the next reporting point, nor was there a procedural requirement to do so at the time.

SAFETY ACTION:

Action Taken:
On 03 September 1987, the Canadian Aviation Safety Board issued two interim recommendations to the Minister of Transport proposing that:

The Department of Transport ensure that all Canadian operators engaged in long-range flights dependent upon on-board area navigation systems carry out a prescribed series of pre-taxi and en route procedural cross-checks to provide redundant protection against gross navigational errors; and

CASB 87-48

The Department of Transport seek international agreement concerning adequate cross-check procedures of area navigation equipment to reduce the possibility of gross navigational errors during long-range intercontinental flights, particularly over the North Atlantic.

CASB 87-49

Transport Canada has replied to these two recommendations in a positive manner.

The Board notes that the United States National Transportation Safety Board (NTSB) concurrently issued similar recommendations in the United States. The NTSB proposed that flight crews of U. S. operators who engage in transoceanic transport employ at least two initial and three en route verification techniques to guard against the use of incorrect navigation information, and that FAA inspectors emphasize to operators the rules that apply to transoceanic operations in a non-radar environment. In addition, Delta Air Lines conducted an internal review of their international operations and subsequently revised several sections of the *Pilot's Operating Manual* that relate to navigational and cross-check procedures. Delta's Transoceanic Flight Crew Bulletins 87-5 through 87-10 refer.

On 13 May 1988, the CASB issued a third recommendation to the Minister of Transport proposing that:

The Department of Transport modify Air Traffic Control procedures to ensure that any discrepancies of five minutes or more between pilot and ATC estimates on the North Atlantic be challenged by the controller at once to verify the estimate.

CASB 88-03

This recommendation has been adopted in Canadian controlled airspace. Further, Transport Canada has advised other North Atlantic Track Provider States of CASB 88-03 and has recommended similar action to the North Atlantic Systems Planning Group.

Action Required:
The potential consequences of the gross navigation error of this occurrence were exacerbated by an antiquated system of flight-following by air traffic services (ATS) using data strips, without benefit of direct pilot/controller communications. Currently, beyond the 200 nautical mile range of present day radars, there is no system of direct air traffic surveillance, and pilot/controller communications are dependent upon often unreliable HF radio contact.

Air traffic on the North Atlantic air routes is expected to increase over the next few years. Canada is one of the major contributors to an ICAO special committee on Future Air Navigation Systems (FANS), which is charged with developing the operational and equipment standards for an international communication, navigation, and surveillance (CNS) system. Several countries are developing global satellite communication and navigation systems. Once in place, these systems will facilitate the safe and efficient control of this increasing air traffic on the North Atlantic.

One of the principal concepts under development by the ICAO FANS Committee is known as Automatic Dependent Surveillance (ADS). With ADS, aircraft will automatically transmit positional data derived from their on-board area navigation system to air traffic control facilities via an air-ground data link, thereby providing controllers with the necessary surveillance system to monitor the flow of air traffic, as cleared. Satellite communications systems will facilitate the direct pilot/controller communications to effect necessary changes in routing to maintain safe separation between aircraft. The ADS concept is promising, and the Board encourages the Department of Transport in its ongoing efforts to reach international agreement for the early implementation of such a system. Optimistically, however, several more years will be required for the development and implementation of ADS into full operational service on the North Atlantic.

In the near term, the problem of direct pilot/controller communication in the Gander Oceanic Control Area persists. Currently, a co-located FSS actually handles the HF communications, relaying pilots' estimates for each waypoint to the air traffic controller who updates his data strips and cross-checks the pilots' estimates. Should a discrepancy arise which affects the safe separation of aircraft, the controller then physically has to go to the FSS operator and attempt to contact the pilot on HF to confirm the accuracy of the estimate. This cumbersome, time-consuming process results in delays that could affect aircraft separation. Because of current problems arising from the lack of direct communication between pilots and air traffic controllers in the Gander Oceanic Control Area and because the potential of ADS remains a longer term proposition, the CASB recommends that:

The Department of Transport take immediate steps to provide more timely and reliable controller/pilot communications in the Gander Oceanic Control Area.

CASB 89-06

Safety Concern:
The Board is concerned that a number of professional aircrew from several countries gave advice to the Delta crew to avoid or delay reporting this incident of a near mid-air collision to air traffic controllers. This represents a significant departure from the traditional operating philosophy of pilots who, through their strong motivation towards accident prevention, have promptly reported their in-flight problems or errors, without fear of career implications. In this case, failure to report the track deviation put many people at risk for a longer than necessary time period while the aircraft manoeuvred to regain the lost track without the assistance of air traffic control. While the Board believes that most aircrew would not deliberately attempt to cover up a near mid-air collision, it is very concerned by the attitude of the various flight crews in the in-flight discussions immediately after this incident. The Board is seeking the support of the major professional pilot associations, air transport associations, and government regulators of the aviation industry in a cooperative effort to help ensure the continued willingness of flight crews to report safety-related matters.

* * * * *

RISK OF COLLISION BETWEEN: BOEING 767 C-GPWA and BOEING 727 C-GAAY TORONTO/LESTER B. PEARSON INTERNATIONAL AIRPORT 55 mi NW 18 FEBRUARY 1987

REPORT NUMBER: 87-O/74041
LOCAL TIME: 1256 EST
INFORMATION SOURCE: Field Investigation

BOEING 767 C-GPWA

OPERATOR: Air Canada
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	18,000	1,750	12,000	2,500
LAST 90 DAYS	200	200	93	93

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	7
PASSENGERS	-	-	76

BOEING 727 C-GAAY

OPERATOR: Air Canada
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	17,500	4,333	12,000	1,683
LAST 90 DAYS	111	111	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	8
PASSENGERS	-	-	111

HISTORY OF THE FLIGHT:

The Boeing 727 (AC192) and the Boeing 767 (AC106) were on identical inbound tracks to Toronto. AC192 was at flight level (FL) 290. AC106 was directly overhead at FL310 and had been cleared to hold at the Borden intersection. Before AC106 entered the holding pattern, the en route controller cancelled AC106's holding clearance and gave descent clearance to 11,000 feet. The controller then immediately attempted to cancel the clearance, and the pilot acknowledged that he understood. AC192 was then given descent clearance to 11,000 feet but did not descend immediately. The controller observed on radar that AC106 was in a descent, and he issued three transmissions over a period of 21 seconds for AC106 to maintain FL310. The pilot eventually responded and halted the descent but not before AC106 had descended through FL290, on the left (east) side of AC192, with about one-quarter mile lateral separation. Evasive vectors were issued after the aircraft appeared on radar to be almost collocated with less than adequate vertical separation. The evasive vectors issued turned the aircraft toward each other.

PERTINENT INFORMATION:

The sky was clear of clouds, and the visibility was good. All aircraft and ground control equipment was functioning normally. Controller staffing at the control centre was compatible with the workload. Holding delays were assigned to inbound traffic because of runway maintenance work which limited the acceptance rate of traffic to the airport.

Radar recordings indicated that the flight data blocks for the aircraft overlapped on the controller's radar screen. The system then repositioned the display: AC106 data block to the west of track and AC192 data block to the east of track. The repositioned data block display was opposite to the actual relative positions of the two aircraft.

ANALYSIS:

The controller intended to descend AC192 first but mistakenly gave the descent clearance to AC106. He realized the error and 19 seconds later, at 1752:35, advised AC106 that their clearance was cancelled. The AC106 flight crew acknowledged, believing that the cancellation referred to was the "holding" cancellation quoted in the two previous exchanges of information. As a result of this misunderstanding, the crew initiated their descent direct to Toronto.

The use of precise control phraseology would have prevented the misunderstanding which precipitated the loss of separation. The controller's transmission to AC106 at 1752:35 did not specify precisely what was cancelled and did not re-clear the flight crew to a specific clearance limit or altitude. It was reasonable then, for the flight crew to assume the controller was referring to the previously cancelled "holding. " When the controller realized that AC106 was descending, he had to transmit to AC106 three times before the crew acknowledged. By the time the crew acknowledged the call and determined what the controller wanted them to do, AC106 had descended to the same altitude as AC192 and 400 yards to the left of it.

Realizing that a critical loss of separation had occurred, the controller then issued evasive turns to both aircraft based on the positions of the flight data blocks. Because the data blocks were opposite to the actual relative aircraft positions, the aircraft were inadvertently turned toward each other rather than away.

The crew of AC192 had visual contact on AC106 at this time and did not turn left as instructed. AC106 initiated a rapid climb to above AC192's altitude before initiating the right turn. Both aircraft continued to their destination uneventfully.

FINDINGS:

Cause Related:

1. AC106 was given descent clearance from FL310 while AC192 was directly below at FL290, resulting in a loss of separation.

2. Imprecise phraseology used by the en route controller to cancel AC106's descent clearance was misunderstood by the flight crew, and they continued their descent.

3. The flight crew of AC106 did not respond to the controller's first two calls to maintain FL310.

4. The auto-flight tag system repositioned the overlapping radar display data blocks which influenced the controller to issue erroneous evasive vectors.

Other:
-Nil-

SAFETY ACTION:

Action Taken:
As a result of this incident, the Board advised Transport Canada of its concerns with respect to the present design of the auto-tag feature of the flight data blocks. The CASB felt that the auto-tag software package should be analysed and possibly modified so that a graphic indication would warn controllers that the tag displacement mode has been effected and that caution was warranted when controlling aircraft with repositioned data blocks.

Transport Canada informed the Board that the present radar sensors accuracy is not sufficient to program the auto-tag function as a function of relative aircraft target position being displayed. In addition, Transport Canada indicated that all control personnel are fully aware of the system's performance parameters and that the repositioning of data blocks cannot occur without the controller's awareness.

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RISK OF COLLISION BETWEEN:
BOEING 737-242 C-GNDL and
CESSNA 172N C-GCGK
THUNDER BAY, ONTARIO 7 mi W
20 FEBRUARY 1987

REPORT NUMBER: 87-C74008
LOCAL TIME: 1528 EST
INFORMATION SOURCE: Field Investigation

BOEING 737-242 C-GNDL

OPERATOR: Canadian Pacific Airlines Ltd.
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	11,763	3,912	6,516	1,428
LAST 90 DAYS	131	131	157	157

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	6
PASSENGERS	-	-	121

CESSNA 172N C-GCGK

OPERATION: Private Recreational
DAMAGE: None
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	125	125
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

HISTORY OF THE FLIGHT:

The Cessna 172 departed from runway 30 at Thunder Bay at about 1523 eastern standard time (EST) on a visual flight rules (VFR) flight to a training area in the vicinity of Kakabeka Falls. After a left turn to a westerly heading, the aircraft climbed to 4,000 feet above sea level (asl).

At 1526 EST, the Boeing 737, on a scheduled flight to Dryden and Winnipeg, was cleared for take-off on runway 25 with a Thunder Bay standard instrument departure number two (SID 2). The flight was operating under instrument flight rules (IFR). Traffic information regarding the Cessna 172 was passed to the crew of the Boeing with their take-off clearance. The flight crew contacted departure control after take-off, was cleared on course, and again advised of the position of the Cessna traffic. At about 1528 EST, the Boeing crew advised departure control that they had passed beneath the Cessna after manoeuvring to avoid a collision.

PERTINENT INFORMATION:

The weather at Thunder Bay at the time of the occurrence, was scattered clouds at 4,000 feet above ground level (agl) and a visibility of about 10 miles.

The Cessna 172 was in radio contact with the Thunder Bay Tower Controller who observed the aircraft, on radar, maintaining a track of about 290 degrees magnetic (M). The Boeing 737 aircraft was under radar departure control and was executing a SID 2 procedure. This procedures states, in part, that following take-off, the aircraft must turn right and maintain a heading of 270 degrees M and anticipate radar vectors. This procedure was followed and departure control cleared the aircraft to climb on course for Dryden, which corresponds to a track of 307 degrees M. In the climb, the Boeing 737 maintained a climb angle of approximately 10 degrees.

Air traffic control (ATC) authorities had advised both aircraft of the relative position of the other, and these transmissions were acknowledged by both aircraft.

ANALYSIS:

The Boeing 737 pilot reported a flight visibility of between one and three miles in haze, although it was observed to be 10 miles on the ground. The discrepancy may have been due to the effects of the sun considering the Boeing 737's climb angle.

After take-off, the Boeing 737 turned to a heading of 270 degrees in compliance with the SID. At this time, both aircraft were proceeding on slightly diverging courses, the Cessna maintaining a track of 290 degrees and the Boeing on a heading of 270 degrees. When the Boeing was cleared by departure control to proceed on course, the pilot turned right to take up the outbound heading for Dryden; as a result, the tracks converged about seven miles from Thunder Bay Airport. This turn was executed without the Boeing 737 pilot having sighted the Cessna although its relative position was known. The tracks came together at an altitude of 4,000 feet asl, with the Boeing 737 overtaking the other aircraft from below and behind.

The routing of IFR departures through the Kakabeka Falls light aircraft activity area increased the risk of collision between IFR and VFR traffic.

FINDINGS:

Cause Related:
1. The Boeing crew turned the 737 aircraft in the direction of the light aircraft without having established visual contact, resulting in a near collision.

Other:
- Nil -

SAFETY ACTION:

Action Taken:
On 08 June 1987, the Canadian Aviation Safety Board forwarded an Aviation Safety Advisory to Transport Canada suggesting that Transport Canada consider reviewing those IFR departure procedures that require IFR aircraft to transit adjacent to or overfly the training area in the vicinity of Kakabeka Falls.

The Canadian Aviation Safety Board investigated this occurrence for the purpose of advancing aviation safety. It is not the object of the Board to determine or apportion any blame or liability.

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RISK OF COLLISION BETWEEN:
SAUNDERS ST27-100 C-FHMQ and
PIPER PA-44 SEMINOLE C-GJBQ
TORONTO/LESTER B. PEARSON INTERNATIONAL AIRPORT, ONTARIO
12 MARCH 1987

REPORT NUMBER: 87-O/74054 (Incident)
LOCAL TIME: 1824 EST
INFORMATION SOURCE: Field Investigation

SAUNDERS ST27-100 C-FHMQ

OPERATOR: City Express
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,800	500
LAST 90 DAYS	180	180

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	18

PIPER PA-44 SEMINOLE C-GJBQ

OPERATOR: Harbour Flying Services
OPERATION: Specialty Flying Training
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,200	150
LAST 90 DAYS	200	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The Saunders ST27-100 aircraft departed Toronto Island Airport under instrument flight rules (IFR) for London, Ontario, at 1822 hours eastern standard time (EST). Following take-off from runway 26, while still climbing to its assigned altitude of 3,000 feet, the crew was given a heading change to 220 degrees magnetic at 1823 hours. At 1824, the Saunders 27 passed in front and below a Piper Seminole at a distance of 500 feet. The Seminole was on a practice instrument landing system (ILS) approach to runway 33 at Toronto/Lester B. Pearson International Airport. No evasive action was taken, and both aircraft continued on their assigned tracks.

PERTINENT INFORMATION:

The crew of the Piper Seminole had requested and received permission to carry out practice ILS approaches to runway 33 under visual flight rules (VFR) conditions at 1739. At that time, the tower controller at Toronto/Lester B. Pearson International Airport advised both the Toronto Island Tower controller and the Toronto Terminal Unit coordinator that an aircraft would be working the ILS to runway 33 at 2,500 feet and below. At 1820 the terminal departure controller advised the tower radar controller that he had an aircraft departing Toronto Island. This transmission was not acknowledged. The message was repeated at 1821 and the transmission was then acknowledged by the tower radar controller.

At 1824 the pilot of the Piper Seminole asked the tower radar controller if the Saunders 27 was appearing on his radar. The tower radar controller advised that it was not. The pilot then advised the controller that the Saunders 27 aircraft had passed just below and in front of his aircraft at a distance of 500 feet. About four seconds before the occurrence, the crew of the Saunders 27 was issued VFR traffic information by departure control that unknown traffic was off to his left side. The pilot of the Saunders 27 reported that the traffic was in sight at the same altitude just as the two aircraft crossed flight paths.

At the time of the incident, the Saunders 27 was climbing to its assigned altitude on a heading of 220 degrees, under departure control. The crew of the Piper Seminole had been cleared by the tower controller to carry out the ILS approach to runway 33.

The Piper Seminole was displayed as a splat only on the departure radar screen at the time. The weather presented good visual conditions with a visibility of 10 miles.

ANALYSIS:

The tower controller did not notice the Saunders 27 approaching the Piper Seminole and as a result did not issue traffic information. The departure controller informed the crew of the Saunders 27 at the last moment as both aircraft approached each other.

FINDINGS:

Cause Related:
1. Traffic information was not passed to the flight crews of either aircraft until after the aircraft passed each other.

2. The tower radar controller and the departure controller did not coordinate traffic in a timely manner in order to prevent the conflict.

Other:
-Nil-

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AEROFLOT
ILYUSHIN IL 86 86075
GANDER, NEWFOUNDLAND
19 MARCH 1987

REPORT NUMBER: 87-A74916 (Incident)

Injuries:	Crew	Passengers	Others	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	12	190	-	202
Total	12	190	-	202

	Captain	First Officer
Pilot Licence	Airline Transport (U. S. S. R.)	Airline Transport (U. S. S. R.)
Total Flying Time	11,000 hr	10,000 hr
Total on Type	2,200 hr	850 hr
Total Last 90 Days	110 hr	75 hr

HISTORY OF THE FLIGHT:

On 19 March 1987, Aeroflot Flight 346, an Ilyushin (IL) 86, 86075, departed Havana, Cuba on a scheduled flight to Moscow, U. S. S. R. with a planned technical stop at Gander, Newfoundland, Canada. On board were 12 crew members and 190 passengers.

Approaching Gander, terminal radar control vectored the aircraft for a straight-in instrument landing system (ILS) approach to the runway in use, runway 04, in instrument meteorological conditions (IMC). The co-pilot, in the right seat, was manually flying the approach when the aircraft intercepted the ILS localizer and glide path. The aircraft, although initially high on the glide path, remained established with drift eliminated on the localizer. At 328 feet (100 metres) above ground level (agl), the rate of descent increased, and the aircraft descended below the glide path and deviated left of the localizer. The captain, in the left seat, took control at decision height (DH), 200 feet (60 metres) agl, continued the approach and completed the landing by visual reference to the runway. The aircraft was still low on the glide path and to the left of the localizer, and the captain was correcting to the right as the aircraft crossed the threshold, 33 feet (10 metres) agl. During the flare and landing, the visibility was reduced by fog, and the captain continued the landing using the radio altimeter for altitude reference. The aircraft touched down in a left-wing-low attitude, 36 feet (11 metres) to the right of the centre line while the captain was correcting back to the left. The aircraft continued to move toward the left side of the runway.

During the landing roll, the left main landing gear damaged several runway edge and taxiway lights on the left side of the runway, and the number one engine pod dragged through the hard-packed snowbank. The application of right rudder during the landing roll started the aircraft back towards the centre line, and, when the nose gear was lowered to the ground, positive steering enabled the captain to return the aircraft to the centre line.

The crew, unaware that the engine had struck the snow or that lights had been damaged, taxied to the gate and shut down the engines. Aeroflot maintenance personnel were commencing their normal duties when they were advised that some aircraft components had been found on the runway, and they were asked to check the aircraft. The maintenance check revealed that a portion of an engine cowling and associated hardware were missing.

A further check of the landing runway by the field foreman confirmed that an engine had struck the snow and dislodged a section of cowling and that four runway edge lights and four taxiway lights had been damaged.

The incident occurred at 0800 Coordinated Universal Time (UTC) during the hours of darkness, at lat 48°56′N, long 54°34′W at an elevation of 496 feet above sea level (asl).

PERTINENT INFORMATION:

Transport Canada *Manual of Snow Removal and Ice Control* outlines a priority system regarding snow removal at airports. Priority I areas include one runway depending on prevailing wind direction, one taxiway, and the terminal area. Priority II areas include another runway and associated taxiway. Priority III areas include all shoulder areas, pre-threshold areas, glide path sites, and any remaining runways, taxiways, or parking areas. Priority I and II areas are normally cleared throughout a storm while Priority III areas are cleared last, in accordance with available manpower and equipment.

The Manual of Snow Removal provides guidelines for snow-removal procedures and indicates desired clearance distances and snow depths.

During Priority III snow-clearing operations, the snow beyond the runway edge lights is to be removed to a distance of at least 25 feet (7. 6 metres) on both sides of all runways and taxiways to ensure that the lights remain uncovered if snow-drifting occurs. Vertical snow slopes are to be avoided along the edges of the runway, taxiways, aprons, and at the ends of the runways. Vertical edges must be rolled or levelled to form a smooth slope, as flat as possible, from the cleared areas to the snow-disposal area. In accordance with Appendix C of the manual, the maximum allowable snow depth 50 feet (15 metres) from the edge of the runway is 2. 5 feet (1. 3 metres). By ICAO recommended practices, the snow depth near the runway edge can be one foot (0. 3 metres) increasing linearly to three feet (0. 9 metres) 50 feet (15 metres) from the runway edge then to five feet (1. 5 metres) at 66 feet (20 metres) from the edge.

Although the required 25-foot (7. 6 metres) area on both sides of runway 04 had been cleared, Priority III area clearing had not been completed because of the heavy snow accumulation in the days prior to the incident, which had kept snow-removal crews busy with Priority I and II areas.

ANALYSIS:

Following the occurrence, the crew stated that they were not aware that the number one engine had contacted the snow or that runway edge lights had been damaged. However, the tire tracks at the edge of the runway, the marks in the snow, and the data from the FDR confirmed that the aircraft had left the runway centre line.

The analysis focuses on the reasons why the aircraft tracked along the left side of the runway during the landing roll.

The FDR information indicated that the hand-flown ILS approach was not completely stabilized. At DH, when the captain took control, the aircraft was below the glide path and to the left of the extended centre line of runway 04. Just prior to touchdown, the captain banked the aircraft quite rapidly to the right and then back to the left, in an attempt to regain the centre line of the runway. The left-wing-down attitude on touchdown was the result of the inputs by the captain while he was flaring the aircraft and eliminating drift.

The weather at the time of Flight 346's arrival was variable. The ceiling remained at indefinite 200 feet obscured; however, the visibility was variable from one-eighth to one-half mile in rain showers and fog. Five minutes prior to landing, the RVR was 3,000 feet (914 metres) and had decreased to 2,600 feet (792 metres) when the aircraft was cleared to land. Because of the movement of the fog over the ground, the visibility over the landing area, just at the time of the flare, could have been less than that recorded by the RVR equipment. The wind, which was from 150 degrees magnetic at eight knots, was a cross-wind with a slight tail component and did require a drift correction during the approach.

The conditions as reported to and observed by the crew indicated that the approach and landing could be conducted safely. This conclusion is supported by the crew's report that the approach lights were in sight at DH. In spite of the conditions at DH, as the aircraft was flared for landing, the visibility rapidly decreased when the aircraft entered an area of thicker fog. The captain did not attempt a go-around because he considered that the conditions at DH would allow a safe landing.

The poor visibility because of the rain and fog, the dark, wet runway, the featureless snow-covered terrain on approach and off the sides of the runway, and the effects of the landing lights shining through the rain and fog all contributed to the crew's inability to adequately see the landing area and maintain the aircraft on the runway centre line. The reduced number of high intensity approach lights may also have hindered the crew's ability to properly position the aircraft for landing.

The captain took control of the aircraft at DH when it was below the glide path and left of the extended centre line of the runway. Because of the rain and fog, the captain had limited visual cues as he attempted to correct to the centre line. At the flare, as the fog thickened and visibility decreased, the captain elected to complete the landing using the radio altimeter for altitude reference. At that point, the captain was deprived of most visual cues and could not adequately see the runway environment. By the time he regained sight of the runway, the aircraft had tracked to the left, as a result of the aircraft heading at touchdown, the wet runway surface and, to some degree, the effect of the cross-wind. The captain was then able to steer the aircraft back to the centre of the runway.

Given the configuration and attitude of the aircraft, it is probable that if snow clearing had been to Transport Canada guidelines, the strike would not have occurred.

As the aircraft passed DH, the captain could see the runway environment and decided that he could land safely. When he lost visual references in the flare, the aircraft was in a position where, in accordance with Aeroflot practice, a go-around should not be attempted.

CONCLUSIONS:

Findings:

1. The landing was completed under the influence of a right cross-wind and slight tail wind, in weather conditions which restricted visual landing references.

2. Two-thirds of the high-intensity approach lights for runway 04 were unserviceable; the relevant NOTAM stated that one-third of the lights were unserviceable.

3. The approach was not stabilized when the captain took control at decision height.

4. As the captain was attempting to correct to the centre line, the aircraft entered an area of more dense fog, and the captain lost adequate visual contact with the runway environment.

5. Because the aircraft was in the landing flare, the captain, in accordance with Aeroflot practice, considered himself committed to land.

6. During the landing, the aircraft touched down with the left wing low; under the influence of the cross-wind and wet runway, the aircraft moved to the left and ran along the left edge of the runway.

7. A four-foot-square section of the nacelle of the number one engine was torn off when the engine struck a snowbank parallel to the runway.

8. The snow depth where the engine struck the snow was up to 4. 5 feet. The snow depth, according to Transport Canada guidelines, should not have exceeded 2. 5 feet; however, Priority III area snow removal had not been completed because of the heavy snow accumulation in the days prior to the incident.

9. The aircraft crew was not aware that Priority III area snow removal had not been completed to Transport Canada guidelines.

10. The flight crew was certified and qualified for the flight.

11. The aircraft weight and centre of gravity were within the prescribed limits.

12. There was no evidence found of any airframe or system malfunction prior to or during the flight.

Causes:
While attempting to land from an unstabilized approach, the pilot brought the aircraft below the altitude prescribed by the standards of the USSR Civil Aviation Ministry for the performance of the missed approach manoeuvre. The pilot was unable to maintain the aircraft on the runway centre line because of the lack of adequate visual references when dense fog was encountered during the landing flare. Contact with a snowbank that was parallel to the runway and that was higher than specified by Transport Canada guidelines contributed to the aircraft damage.

SAFETY ACTION:

The Canadian Aviation Safety Board (CASB) notes the following action taken by USSR Civil Aviation Authorities as a consequence of this occurrence:

a. The circumstances and causes of this occurrence have been the subject of a promotional campaign to both flight and air traffic control personnel;

b. Steps have been taken to exclude the possibility of aircrew "ducking under" the prescribed glide path while conducting an approach in adverse weather conditions; and

c. Flight crews are now permitted to initiate a go-around, if required, from any flight altitude during the final stages of the approach.

The CASB forwarded an Aviation Safety Advisory to the Department of Transport, addressing the snow-removal guidelines for airports across Canada. The CASB suggested that Transport Canada review the current snow-clearing guidelines for relevancy, ease of understanding, and consistency of application. Transport Canada has indicated that:

a. A review of the current snow-clearing practices will be conducted by officials of the Airport Authority Group; and

b. Transport Canada will ensure that there is no misunderstanding on the part of airport supervisors in regard to the snow-removal guidelines.

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AEROFLOT
ILYUSHIN IL 86 86074
GANDER, NEWFOUNDLAND
19 MARCH 1987

REPORT NUMBER: 87-A74917

	Pilot-At-Controls	First Officer
Pilot Licence	Airline Transport (U.S.S.R.)	Airline Transport (U.S.S.R.)
Total Flying Time	15,000 hr	9,500 hr
Total on Type	2,100 hr	900 hr
Total Last 90 Days	135 hr	135 hr

Injuries:	Crew	Passengers	Others	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	6	-	-	6
Total	6	-	-	6

HISTORY OF THE FLIGHT:

On 19 March 1987, Aeroflot Flight 345B, an Ilyushin (IL) 86, 86074, departed Moscow, U. S. S. R. on a ferry flight to pick up passengers stranded from Aeroflot Flight 346, at Gander, Newfoundland, Canada. After a planned refuelling stop at Shannon, Ireland, the flight continued to Gander. On board were six crew members. The pilot, who was at the controls in the left seat at the time of the incident, was not the aircraft captain. He was a company check-pilot who had been given the opportunity to fly the ferry flight from Moscow to Gander. He was to have completed a flight crew check on the aircraft crew during their return flight to Moscow.

Approaching Gander, terminal radar control vectored the aircraft for a straight-in instrument landing system (ILS) approach to runway 13, in instrument meteorological conditions (IMC). The co-pilot in the right seat was manually flying the approach when the aircraft intercepted the ILS localizer and glide path. The aircraft was initially established on the glide path but was deviating right and left of the localizer. With the runway approach lights in sight, the pilot in the left seat took control at decision height (DH), 200 feet (60 metres), and elected to continue the approach and complete the landing by visual reference to the runway. As the aircraft passed DH, it was below the glide path in a right-wing-low attitude. Several large roll corrections were made prior to the aircraft crossing the threshold at 50 feet (15 metres), slightly left of the centre line of the runway. During the flare and touchdown, the aircraft entered thicker fog and the visibility decreased, making it difficult to see the runway environment. A correction to the right was made, and the aircraft touched down in a right-wing-low attitude, 36 feet (11 metres) to the right of the centre line. The right bank was quickly reduced, but the aircraft ran off the right side of the runway. The pilot, aware that the aircraft was moving to the right, applied left rudder and increased the power slightly on the number four engine, and the aircraft returned to the runway.

During the excursion from the runway, the right main landing gear tracked through the snow 43 feet (13 metres) to the right of the edge of the runway. The number four engine pod struck the ground or dragged through the snow at, or shortly after touchdown, and the number one engine pod scraped the runway while the aircraft was being returned to the runway. The right main landing gear damaged two runway edge lights.

The crew, unaware that the aircraft had left the runway surface, did not realize that there was any damage, so they taxied to the terminal and shut down the engines. Company officials were not aware of a problem until the field foreman had completed his runway inspection and reported damaged runway lights and tire tracks in the snow at the edge of runway 13.

The incident occurred at 2321 Coordinated Universal Time (UTC), during the hours of darkness, at lat 48°56'N, long 54°34'W at an elevation of 496 feet above sea level (asl).

PERTINENT INFORMATION:

Transport Canada Manual of Snow Removal and Ice Control outlines a priority system regrading snow removal at airports. Priority I areas include one runway depending on prevailing wind direction, one taxiway, and the terminal area. Priority II areas include another runway and associated taxiway. Priority III areas include all shoulder areas, pre-threshold areas, glide path sites, and any remaining runways, taxiways, or parking areas. riority I and II areas are normally cleared throughout a storm while Priority III areas are cleared last, in accordance with available manpower and equipment.

The Manual of Snow Removal provides guidelines for snow-removal procedures and indicates desired clearance distances and snow depths.

During Priority III snow-clearing operations, the snow beyond the runway edge lights is to be removed to a distance of at least 25 feet (7. 6 metres) on both sides of all runways and taxiways to ensure that the lights remain uncovered if snow-drifting occurs. Vertical snow slopes are to be avoided along the edges of the runway, taxiways, aprons, and at the ends of the runways. edges must be rolled or levelled to form a smooth slope, as flat as possible, from the cleared areas to the snow-disposal area. In accordance with Appendix C of the manual, the maximum allowable snow depth 50 feet (15 metres) from the edge of the runway is 2.5 feet (1.3 metres). By ICAO recommended practices, the snow depth near the runway edge of the runway can be one foot (0.3 metres) increasing linearly to three feet (0.9 metres) 50 (15 metres) from the runway edge then to five feet (1.5 metres) at 66 feet (20 metres) from the edge. (See Appendix B.)

Although the required 25-foot (7.5 meters) area on both sides of runway 04 had been cleared, Priority III area clearing had not been completed because of the heavy snow accumulation in the days prior to the incident, which had kept snow-removal crews busy with Priority I and II areas.

ANALYSIS:

Following the occurrence, the crew stated that they were not aware that the aircraft had left the runway surface, or that the aircraft or runway edge lights had been damaged. However, the measurement of the marks in the snow beside the runway and the data from the FDR confirmed that the aircraft had departed the runway surface during the landing.

The analysis focuses on the reasons why the aircraft departed the runway surface during the landing.

The FDR information indicated that the hand-flown ILS approach was not completely stabilized when the aircraft reached DH. At DH, when the pilot in the left seat took control, the aircraft was below the glide path and moving to the right of the localizer. In spite of several rapid corrections in an attempt to align the aircraft with the centre line, the aircraft was 33 feet (10 metres) to the left of the centre line when it crossed the threshold 50 feet (15 metres) agl. Right bank was applied, and the aircraft touched down in a right-wing-low attitude, 36 feet (11 metres) to the right of the centre line. The right-wing-down attitude and the excursion off the runway were the result of inputs by the pilot while he was flaring the aircraft and attempting to maintain the centre line.

The observed weather at the time of the incident indicated that the weather was below limits for runway 13; however, because the RVR was 1,200 feet or greater, the approach could be conducted. The flight was also advised that the crew of an aircraft that had landed 13 minutes earlier indicated that the conditions on final approach were better than the reported observations.

The conditions as reported and observed by the crew indicated that the approach and landing could be conducted safely. This conclusion is supported by the crew's report that the approach and runway edge lights were in sight at DH. In spite of conditions at DH, as the aircraft was flared for landing, the fog became thicker, and the visibility decreased. Because of the movement of the fog over the ground, the visibility over the landing area, just at the time of the flare, could have been less than that recorded by the RVR equipment or as observed by other pilots. The pilot did not attempt a go-around because he considered that the conditions at DH would allow a safe landing.

The poor visibility because of the rain and fog, the dark, wet runway, the featureless snow-covered terrain on approach and off the sides of the runway, and the effects of the landing lights shining through the rain and fog all contributed to the crew's inability to adequately see the landing area and maintain the aircraft on the runway centre line.

The pilot took control at DH and elected to complete the landing because he had the runway environment in sight. Because of the rain and fog, the pilot had limited visual cues as he attempted to correct to the centre line. During the flare and landing, the visibility decreased unexpectedly because of the thicker fog and deprived the pilot of essential visual landing cues. The pilot, aware that the aircraft was moving to the right, applied corrective action; however, because visual landing references were obscured by the fog, he was unable to prevent the aircraft from leaving the runway surface.

It could not be determined exactly when the number four engine struck the surface; however, because there was very little snow in the area where the strike occurred, snow depth was not instrumental in causing the strike.

As the aircraft passed DH, the pilot could see the runway environment and decided that he could land safely. When he lost visual references in the flare, the aircraft was in a position where, in accordance with Aeroflot practice, a go-around should not be attempted.

CONCLUSIONS:

Findings:
1. The landing was completed in weather conditions which restricted visual landing references.

2. The approach was not stabilized when the pilot in the left seat took control at decision height.

3. As the pilot was attempting to correct to the centre line, the aircraft entered an area of more dense fog, and the pilot lost adequate visual contact with the runway environment.

4. Because the aircraft was in the landing flare, the pilot, in accordance with Aeroflot practice, considered himself committed to land.

5. The aircraft landed in a right-wing-low attitude, resulting in the number four engine pod sustaining minor damage when it scraped the snow-covered ground as the aircraft ran off the side of the runway.

6. The number one engine pod sustained minor damage when it scraped the runway as the aircraft came back onto the runway surface.

7. The snow depth where the landing gear travelled through the snow was up to 5. 5 feet (1. 7 metres). The snow depth, according to Transport Canada guidelines, should not have exceeded 2. 5 feet (0. 8 metres). However, Priority III area snow removal had not been completed because of the heavy snow accumulation in the days prior to the incident.

8. The aircraft crew was not aware that Priority III area snow removal had not been completed to Transport Canada guidelines.

9. The flight crew was certified and qualified for the flight.

10. The aircraft weight and centre of gravity were within the prescribed limits.

11. There was no evidence found of any airframe or system malfunction prior to or during the flight.

Causes:
While attempting to land from an unstabilized approach, the pilot brought the aircraft below the altitude prescribed by the standards of the USSR Civil Aviation Ministry for the performance of the missed approach manoeuvre. The pilot was unable to maintain the aircraft on the runway centre line because of the lack of adequate visual references when dense fog was encountered during the landing flare.

SAFETY ACTION:

The Canadian Aviation Safety Board (CASB) notes the following action taken by USSR Civil Aviation Authorities as a consequence of this occurrence:

a. The circumstances and causes of this occurrence have been the subject of a promotional campaign to both flight and air traffic control personnel;

b. Steps have been taken to exclude the possibility of aircrew "ducking under" the prescribed glide path while conducting an approach in adverse weather conditions; and

c. Flight crews are now permitted to initiate a go-around, if required, from any flight altitude during the final stages of the approach.

The CASB forwarded an Aviation Safety Advisory to the Department of Transport, addressing the snow-removal guidelines for airports across Canada. The CASB suggested that Transport Canada review the current snow-clearing guidelines for relevancy, ease of understanding, and consistency of application. Transport Canada has indicated that:

a. A review of the current snow-clearing practices will be conducted by officials of the Airport Authority Group; and

b. Transport Canada will ensure that there is no misunderstanding on the part of airport supervisors in regard to the snow-removal guidelines.

* * *

AIR ONTARIO LIMITED
CONVAIR 580 C-GJRP
LONDON AIRPORT, ONTARIO
20 MARCH 1987

REPORT NUMBER: 87-O/74062 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 2149 EST
OPERATION: Scheduled International
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	10,600	6,200
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	4
PASSENGERS	-	-	42

SUMMARY REPORT:

The aircraft was on a scheduled flight from London, Ontario to Cleveland, Ohio, U. S. A. En route, at an altitude of 6,000 feet, one of the reading light switches located in the mid-cabin area started arcing, and blue flames were observed around the switch. A flight attendant extinguished the fire with a Halon fire extinguisher, and the captain was notified of the incident. The captain informed the London Airport Control Tower, and the aircraft returned to the airport where fire-fighting crews and equipment met the aircraft upon landing. The aircraft taxied to the ramp at the terminal building, and the occupants exited safely.

Damage to the cabin was limited to the area surrounding the switch on the overhead panel. No smoke was present in the cabin, only an odour of "burnt wire."

The company's maintenance department reported that the reading light switch was found loose in its mounting bracket. Because the switch was free to move, one of the powered electrical terminals protruding from the switch made contact with anadjacent light socket. The powered terminal used the light socket as a ground, resulting in the arcing and blue flames that were observed.

FINDINGS:

Cause Related:
1. A powered terminal on a loosely mounted reading light switch grounded against a light socket, causing arcing and blue flames in the cabin.

Other:
-Nil-

* * *

AIR CANADA
LOCKHEED 1011-385-15 TRISTAR C-FTNI
SEPT-ÎLES, QUÉBEC
03 APRIL 1987

REPORT NUMBER: 87-Q74030 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 2119 EST
OPERATION: Scheduled International
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	25,000	372
LAST 90 DAYS	125	125

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	13
PASSENGERS	-	-	144

HISTORY OF THE FLIGHT:

The aircraft was on a scheduled international flight from Mirabel Airport, Québec, to Paris, France. While climbing through 27,000 feet, two bangs were heard, and an increase in the exhaust gas temperature (EGT) of the number three engine (RB-211-22B-02) was observed. After reaching cruise altitude, 20 minutes later, another bang was heard, and a further EGT increase was observed. The engine was shut down because abnormal vibration readings were being registered. The aircraft diverted to Montreal Dorval Airport, Québec, some fuel was dumped in order to reduce the aircraft weight to that permitted for landing, and the aircraft landed safely.

PERTINENT INFORMATION:

The digital flight data recorder showed a momentary 74 degrees Celsius increase in the number three engine EGT when the first bang occurred. The EGT then settled to 55 degrees above the steady state level. After reaching cruise altitude, the second bang occurred, and there was a momentary EGT increase of 63 degrees Celsius. The high pressure rotor speed (N3) showed increases consistent with the EGT increases. The engine vibration was reported as 2. 4 unitsafter the first bang, settling to 2. 1 units, then 2. 4 units after the second bang. Engine shutdown is mandatory when vibration reaches 2. 5 units.

The engine high-pressure compressor stage two stator vanes were found to be severely damaged on the trailing edges. One stator vane had lost almost all of its airfoil, and eight other stage two vanes were broken across the airfoil. Stage three to stage six compressor blades were severely damaged, and there was a partial loss of six stage three blades. All the stage three compressor blades were severely battered, and some had major reductions in the blade incident angle. The compressor blade failures were fresh and were clearly the result of sudden fracture. The failure sites of the stator vanes showed oxidation, indicating that at least one stator vane failed prior to the stage three blade breakages. The stator vane failure is attributed to fatigue damage. The failed vane set was overhaul-inspected prior to the last installation, and the overhaul included a crack check. A Rolls-Royce non-mandatory Service Bulletin, 72-5621, replaces the blazed stator, which failed, with a forged stator. This is the first such failure experienced by Air Canada, although other operators have experienced this problem. Air Canada is complying with this Service Bulletin as parts become due.

ANALYSIS:

Fatigue failure of a high pressure compressor stage two stator vane in the number three engine led to considerable high pressure compressor damage downstream and some turbine damage. The engine compressor stalled, causing the EGT to increase and the engine to vibrate excessively. As a result, the engine was shut down and the aircraft returned to Montreal and landed.

FINDINGS:

Caused Related:
1. A high pressure compressor stage two stator vane in the number three engine failed from fatigue.

Other:
-Nil-

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CUBANA AIRLINES
ILYUSHIN IL 62 FLIGHT CUBANA 9247
STEPHENVILLE, NEWFOUNDLAND
08 APRIL 1987

REPORT NUMBER: 87-A74923 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1825 NDT
OPERATION: Scheduled International
DAMAGE: Nil
PILOT LICENCE: N/A

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,000	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	N/A
PASSENGERS	-	-	N/A

SUMMARY REPORT:

The aircraft, Cubana 9247, was flying from Milan, Italy to Gander, Newfoundland and had to divert to Stephenville, Newfoundland because of unsuitable weather in Gander.

The following sequence of events describes the history of the flight:

2112 Coordinated Universal Time (UTC) – Gander Area Control Centre (ACC) cleared Cubana 9247 for a back course instrument landing system approach to runway 10 at Stephenville.

2123 UTC – Cubana 9247 reported 30 nautical miles east of Stephenville.

2142 UTC – Gander ACC queried Stephenville Flight Service Station (FSS) concerning the status of Cubana 9247; they were observing him on radar 10 miles north of the localizer.

2150 UTC – Gander ACC asked Stephenville FSS to request Cubana 9247's intentions, as they were observing him on radar 10 miles northwest of the airport at 700 feet above sea level (asl) on the radar read-out.

2150 UTC – Cubana 9247 advised Stephenville FSS that he was on final for runway 10.

Between 2150 and 2154 UTC, two Royal Canadian Mounted Police Officers observed the Cubana aircraft flying southbound through a valley below the hilltops at an estimated height of 600 to 800 feet asl.

2155 UTC – The Cubana 9247 landed safely at Stephenville.

The radar-observed position of the aircraft, 10 miles north of the localizer at an altitude of 700 feet asl, put the aircraft in a position where hills rising to 1,200 feet asl were between the aircraft and the airport. The aircraft was observed to fly southbound from this position through a narrow valley, below the level of the hills, to final approach. The weather at Stephenville was reported as 2,000 feet scattered, 4,000 feet broken, and 8,000 feet overcast, with 15 miles visibility.

The pilot was flying a back course ILS approach without the benefit of radar vectors. Although Cubana uses Stephenville as the alternate for Gander, their aircraft rarely land there; as a result, the pilot was probably unfamiliar with the approach. The Canadian Aviation Safety Board was unable to interview the crew or obtain any information from the airline that was useful in determining the cause of the incident.

CONCLUSIONS:

Findings:

1. The aircraft made a gross deviation from course while conducting a back course ILS approach at Stephenville.

2. While off course, the pilot flew at an altitude that placed the aircraft below hilltops between the aircraft and the airport.

3. The aircraft flew through a valley below the hilltops while regaining final approach.

Causes:

The Canadian Aviation Safety Board could not determine the cause of this occurrence.

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WARDAIR CANADA INC.
AIRBUS A300B 4203 C-GIZJ
LESTER B. PEARSON
INTERNATIONAL AIRPORT
TORONTO, ONTARIO 15 mi NW
07 MAY 1987

REPORT NUMBER: 87-O74097
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2157 EDT
OPERATION: Scheduled Domestic
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	12,450	300
LAST 90 DAYS	210	210

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	10
PASSENGERS	-	-	61

HISTORY OF THE FLIGHT:

The aircraft was on a scheduled flight from Toronto, Ontario to Calgary, Alberta. At an altitude of 22,000 feet, the crew heard a "clunk" and observed that the left engine (General Electric CF6-50C2) was spooling down and the oil quantity was decreasing. The engine was then manually shut down by the crew, using the procedure listed in the "Engine Damage" check-list. The aircraft returned to Toronto, where an uneventful landing was carried out with emergency equipment standing by.

PERTINENT INFORMATION:

Examination of the engine revealed a break in the radial drive shaft which powers the accessory gearbox. Components essential to the operation of the engine, such as the oil pump and fuel pump, which are driven from the accessory gearbox, ceased to function.

Service Bulletins SB 72-827 and SB 72-922 issued for this type of engine had not been incorporated in the occurrence engine. The reason that SB 72-827 had not been incorporated was that it was not applicable to this particular engine, according to information received from Transport Canada. The reason that SB 72-922 had not been incorporated was that it was not issued until October 1987, and the occurrence took place on 07 May 1987.

The shaft housing, which embodies the radial drive shaft and acts as an oil transfer tube, was also severely damaged. The majority of damage was in the lower section, surrounding the lower bearing, with a large hole in the middle section.

ANALYSIS:

The extent of damage to the shaft housing assembly in the area of the lower bearing suggests that the lower bearing failed first, allowing the middle and lower sections of the shaft to wobble while rotating, until the shaft broke. This resulted in a loss of drive between the inlet gearbox and the accessory gearbox. Components necessary for the operation of the engine ceased to function, and the engine stopped. The hole in the shaft housing assembly was caused by the damaged shaft. The engine oil drained out through the hole in the bypass duct. It could not be determined why the bearing failed.

FINDINGS:

Cause Related:

1. The lower bearing failed, allowing the radial drive shaft to wobble while rotating, until it eventually broke.

2. The failure of the drive shaft resulted in a loss of drive to the accessory gearbox and the engine's critical components, making it necessary to shut down the engine.

Other:

-Nil-

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RISK OF COLLISION BETWEEN: BOEING 767-233 C-GAUP AND CESSNA 172N N739KY TORONTO/LESTER B. PEARSON INTERNATIONAL AIRPORT, ONTARIO 17 MAY 1987

REPORT NUMBER: 87-O/74110
LOCAL TIME: 0919 EDT
INFORMATION SOURCE: Field Investigation

BOEING 767-233 C-GAUP

OPERATOR: Air Canada
OPERATION: Scheduled Domestic
DAMAGE: Nil
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	16,350	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	8
PASSENGERS	-	-	158

CESSNA 172N N739KY

OPERATION: Private Recreational
DAMAGE: Nil
PILOT LICENCE: Private (U. S. A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	213	130
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

HISTORY OF THE FLIGHT:

As the captain of the Boeing 767 began the take-off roll on runway 24R, he observed a Cessna 172 crossing the runway at the runway 10 intersection. The take-off was rejected without further incident.

PERTINENT INFORMATION:

The Cessna 172 was taxiing for runway 33 and had been issued taxi instruction by the ground controller; the pilot was to taxi via runway 10 and to hold short of runway 33. The pilot had not been instructed to hold short of runway 24R although it had been the intention of the ground controller to issue that instruction.

The Cessna pilot observed the Boeing 767 taxi to position but believed the other aircraft was holding in position to allow him to cross the runway. The ground controller observed the Cessna approach the runway but thought it would hold short.

The Cessna 172 was monitoring ground control frequency, and the Boeing 767 had changed to tower frequency prior to the occurrence.

ANALYSIS:

The ground controller instructed the Cessna 172 pilot to taxi via a routing which crossed an active runway and did not request the pilot to hold short of, or call for clearance prior to crossing, the active runway. Because he had not been instructed to do so, the pilot of the Cessna did not hold short of the active runway and crossed ahead of the Boeing 767.

FINDINGS:

Cause Related:

1. The ground controller instructed the Cessna 172 pilot to taxi via a routing which crossed an active runway.

2. The Cessna 172 crossed the active runway as instructed and caused the Boeing 767 to reject the take-off run.

Other:
-Nil-

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RISK OF COLLISION BETWEEN:
CONVAIR 640 C-FPWY and
BEECH 95-C55 BARON C-FVQR
EDMONTON MUNICIPAL AIRPORT, ALBERTA
01 JUNE 1987

REPORT NUMBER: 87-W74053
LOCAL TIME: 1610 MDT
INFORMATION SOURCE: Field Investigation

CONVAIR 640 C-FPWY

OPERATOR: Time Air
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	6,500	2,000	2,300	250
LAST 90 DAYS	200	200	120	120

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	4
PASSENGERS	-	-	N/A

BEECH 95-C55 BARON C-FVQR

OPERATOR: Concord Drilling Services
OPERATION: Private Company Business
DAMAGE: None
PILOT: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	10,000	800
LAST 90 DAYS	50	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

Three aircraft were approaching the Edmonton Municipal Airport to land on runway 30. The first aircraft was a de Havilland Dash 8 which was about one and one-half miles on final approach. The second, a Convair 640, was approaching from the northeast for right base, and the third, a Beech Baron, was approaching from the southwest for left base. A fourth aircraft, a Boeing 727, had just landed and was taxiing to the terminal building.

As the Convair 640 became established on the final approach to the runway, the pilot-in-command saw the Baron, which was located about 200 feet ahead and slightly below, just completing a turn from left base.

The pilot-in-command told the co-pilot, who was flying the aircraft, to initiate a go-around and a climbing right turn to avoid the Baron. The Convair 640 completed a 360-degree turn, rejoined the final approach, and completed a normal landing.

PERTINENT INFORMATION:

When the Baron pilot reported that he was approaching from the southwest, the tower controller informed him that he was number three following a Convair established on right base. The Baron pilot saw a large aircraft on final (the Dash 8), and he answered the tower with, "I think we got the Convair, white and red?" to which the tower replied, "That will be the one. " The Boeing 727 taxiing in was assumed to be number one and the aircraft on final, number two.

The Convair crew heard this conversation and believed the Baron pilot had them in sight and would follow them in. The Baron, which was then on left base, would not have been visible to the co-pilot of the Convair during the right turn to final. The Baron would also have been below the line of sight of the pilot-in-command of the Convair while the Convair was in the turn.

ANALYSIS:

The Baron pilot assumed that the only aircraft he could see in the air was the number two aircraft he was to follow and that the number one aircraft had already landed. The tower controller assumed the Baron pilot had correctly identified the Convair, and the Convair crew assumed the Baron pilot had them in sight and would position his aircraft behind them.

FINDINGS:

Cause Related:

1. The Baron pilot assumed the aircraft he saw on final approach was the aircraft he was to follow, with the result that he turned onto final approach just ahead of the Convair.

2. The tower controller assumed the Baron pilot had the traffic in sight based on the reported colour of the aircraft the pilot saw instead of confirmation of its position.

Other:
-Nil-

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RISK OF COLLISION BETWEEN:
BOEING 737-200 C-GGPW and
LOCKHEED C5A GALAXY MAC 00459
KAMLOOPS, BRITISH COLUMBIA
02 JUNE 1987

REPORT NUMBER: 87-P74052
LOCAL TIME: 0903 PDT
INFORMATION SOURCE: Field Investigation

BOEING 737-200 C-GGPW

OPERATOR: Canadian Airlines International
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	15,000	6,000	7,000	1,500
LAST 90 DAYS	200	200	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	6
PASSENGERS	-	-	32

LOCKHEED C5A GALAXY MAC 00459

OPERATOR: Military Air Command U. S. A.
OPERATION: State
DAMAGE: None
PILOT LICENCE: Military

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	N/A
PASSENGERS	-	-	N/A

HISTORY OF THE FLIGHT:

The Boeing 737 was on an instrument flight rules (IFR) flight from Vancouver, British Columbia to Edmonton, Alberta. The Galaxy aircraft, also on an IFR flight, was en route from Elmendorf, Alaska to Corpus Christi, Texas; both aircraft were established at flight level (FL) 330. While the Boeing 737 was approaching a position 7. 5 nautical miles east-northeast of Kamloops, British Columbia, on a heading of 020 degrees magnetic, the Galaxy was approaching the same position on an approximate heading of 118 degrees magnetic. At that time, Kamloops radar in the Vancouver Area Control Centre (ACC) was experiencing data interruption, and targets were dropping from the radarscope. Controller

Number Two, who was on duty, informed the flight crew of the Boeing 737 that a loss of their radar target had occurred. The target for the Galaxy had also disappeared, but the controller did not inform the flight crew, nor did he initiate non-radar separation. The flight crew of the Boeing 737 established visual contact with the Galaxy and took evasive action by turning to the left, to pass behind it. As the Boeing 737 passed behind the Galaxy, it encountered the Galaxy's wake turbulence, which resulted in a brief period of turbulent flight, but the aircraft was not damaged, nor were any of its crew or passengers injured.

PERTINENT INFORMATION:

Radar coverage within the Cranbrook Sector is provided by the Kamloops (KA) military radar. Its surveillance radar data is jointly used by the Department of National Defence (DND) and the Vancouver ACC. This sector is normally staffed by one controller performing both radar and data functions, when traffic conditions are light.

The KA radar unit had a documented history of unreliable performance. For reasons which have not been conclusively determined, it had been dropping targets, splitting targets, and, sometimes, there were holes in its area of coverage; the data interruptions were usually of short duration. At the time of the occurrence, it was undergoing maintenance and calibration checks in conjunction with a military flight-check aircraft. Controller workload at the time of the occurrence was light, with five aircraft operating within the sector handled by Kamloops radar. Under these conditions, Controller Number Two, when coming on duty, would have had the time and opportunity to examine the current flight data strips in the rack to confirm his information on the traffic under his control. At the time of the occurrence, the target of the Boeing 737 and the Galaxy had dropped off the radar screen.

The air traffic control (ATC) Manual of Operations (MANOPS) describes controller responsibility and radar procedures; it states that any controller, when coming on duty and before assuming the responsibilities for operating any position in an ATC unit, should devote as much time as is necessary to familiarize himself completely with the work being performed at the position concerned and that, on completion of a tour of duty, a comprehensive briefing is to be given to the relieving controller. It further states that, if an equipment malfunction is detected, the controller should immediately report the malfunction to his supervisor and discontinue use of the equipment if it is apparent that the malfunction could create a hazardous situation. Aircraft should then immediately be informed that radar service is terminated, and the controller should take immediate action to provide for non-radar separation.

The use and purpose of red warning indicators on flight progress strips and the placement of such strips in a cocked position in the rack is depicted in the Air Traffic Control Manual of Training (TP1701), Part 3. It states that red warning indicators are to be used to attract attention to potential hazards, such as a conflict with other aircraft, and they indicate to the controller that corrective action will be necessary. A flight-progress strip in the cocked position signals to the controller that the flight data and/or the subject aircraft require special attention.

Controller Number One, who had more than 17 years of air traffic control experience, was licensed and qualified and was an acting team supervisor. He was working as en route controller when the position estimates for both aircraft were passed, and he placed the flight progress strip for the Galaxy in a level position in the rack, and the strip for the Boeing 737 in a cocked position, without marking them with red warning indicators as required. Flight-progress strips concerning both aircraft were posted under the "Enderby" header. Controller Number One was aware of a potential conflict between an Air Canada flight and the military flight-check aircraft, both at FL350, and he was also concerned about the need for an airspace reservation for the flight-check aircraft. Additionally, as supervisor, he was involved, via the Data System Coordinator, in resolving the problems created by the data interruptions from the KA radar. When he was relieved from the control position by Controller Number Two he did not inform him of the potential conflict between these two aircraft. In his statement to the investigator, Controller Number One expressed strong feelings about the recurring equipment problems, staffing practices which could have a negative effect on air traffic services, and his own family problems, all of which he considered to have possibly contributed to the occurrence.

Controller Number Two was licensed and qualified. He took over controller duties from Controller Number One at 0849 PDT. After receiving a briefing on the traffic situation from Controller Number One, there was a discussion between them about the unreliable performance of the KA radar and the potential conflict at FL350 between the Air Canada flight and the military flight-check aircraft. Six minutes after Controller Number Two took over the position, the radar target of the Boeing 737 disappeared. Because of the radar failure, Controller Number Two then asked the controller working the Prince George Sector to delay the hand-off of the Galaxy which was approaching his sector from Williams Lake. After this exchange with the Prince George Sector Controller, he terminated radar service to the Boeing 737. A momentary acquisition of the Galaxy target at 0856 PDT allowed for the delayed hand-off to take place; the target then disappeared and was not seen again until after the occurrence took place. Approximately six minutes after Controller Number Two had assumed control of the Galaxy and approximately one minute after he had informed the crew of the Boeing 737 that their target had been lost, the controller requested a distance read-out to the Cranbrook very high frequency omnidirectional range (VOR) from the crew of the Galaxy. About 30 seconds later, he was informed by the crew of the Boeing 737 that they had taken evasive action. In his statement, Controller Number Two stated that a confrontation with management the day before and his pending divorce had increased his stress level and may have affected his performance.

Dr. R. A. Alkov, of the Naval Safety Centre at Norfolk, Virginia has, as early as 1973, established a weighted list of life events and life styles "that increase the probability of human error because of emotional instability." In compliance with the government's stated intentions to reduce the size of the public service, some changes to the air traffic services organization were underway but had not yet affected the number of controllers employed in the Vancouver ACC; however, the number of aircraft handled by the Vancouver ACC had increased, and controllers were now asked to work longer periods between breaks.

A check of the serviceability reports of the KA radar and a survey interview with several controllers confirmed that the KA radar unit had a long history of inconsistent and unreliable data presentation. The survey also revealed that these data interruptions were not dealt with in the same manner by all controllers. Depending on the amount of traffic and their previous experiences with this radar unit, some controllers would immediately terminate radar service and revert to non-radar separation, while others would wait for periods as long as four minutes for the signal to return, before reverting to non-radar separation. The use of non-radar separation usually results in significant delays to aircraft movements on the ground and in the air.

ANALYSIS:

KA radar has a history of frequent data interruptions, usually of short duration. The controllers working that sector have developed a tolerance to this shortcoming and, depending on the amount of traffic and the duration of the failure, have delayed reverting to non-radar separation, as this usually results in lengthy delays to aircraft intending to transit the area. It is apparent that Controller Number Two was delaying the switch to non-radar separation at the time of the occurrence, even though he had lost the radar data on both aircraft for several minutes. However, as the traffic was light at the time, it is doubtful that there was any benefit gained by delaying the switch to non-radar separation.

During this period, unknown to Controller Number Two, the Boeing 737 and the Galaxy, which were at the same altitude, were also on converging courses. Probably because of the length of time that had elapsed since the loss of the two radar targets, the controller advised the Boeing 737 that he had lost radar identification. Immediately after, he requested a position report from the Galaxy, and this position report was followed by the Boeing 737 crew's request for information on the aircraft which was approaching from the left. The pilot of the Boeing 737, having assessed the situation, then altered course to avoid the risk of a collision.

MANOPS provides the controller with the power to use his discretion in the case of malfunctioning radar equipment, as long as no hazardous situation is created. However, in this case, the controller waited too long for the targets to return before confirming their relative positions and taking appropriate control measures to ensure their separation. When Controller Number Two took over the position, he was not informed of the potential conflict during the briefing he received from Controller Number One. The appropriate red warning indicators were not marked on the flight progress strips, and only one was placed in a cocked position on the data board. This did not alert Controller Number Two to the potential hazard; however, he had been on duty for nearly 15 minutes, and the light traffic conditions allowed him time to familiarize himself with all the traffic under his control.

Both of the controllers involved admitted to being under considerable stress, induced by family and work-related problems; it is possible that this may have affected their performance.

CONCLUSIONS:

Findings:

1. The Kamloops radar has a history of unreliable performance.

2. At the time of the occurrence, the Kamloops radar did not display either aircraft as a target.

3. Controller Number One did not place red warning indicators on the flight progress strips, nor did he place both progress strips in a cocked position in the rack.

4. Controller Number One did not provide Controller Number Two with a complete briefing on the traffic.

5. Controller Number Two did not fully familiarize himself with the traffic situation after taking over the position.

6. Controller Number Two did not initiate non-radar traffic separation when the targets disappeared from the radar.

7. Both controllers were under stress from personal problems.

8. The crew of the Boeing 737 sighted the Galaxy and took evasive action.

Causes:
Controller Number Two was not provided with a complete briefing by Controller Number One when he took over the position, nor did he subsequently fully familiarize himself with the traffic situation. When the Kamloops radar failed, Controller Number Two did not take appropriate control measures to ensure separation between the two aircraft.

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AIR CANADA
BOEING 767-233 C-GAVF
NORTH ATLANTIC (53°00'N, 15°00'W)
12 JULY 1987

REPORT NUMBER: 87-A74070 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0400 ADT
OPERATION: Scheduled International
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	18,448	1,499	6,788	840
LAST 90 DAYS	130	130	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	8
PASSENGERS	-	-	165

SUMMARY REPORT:

The flight was proceeding from Halifax, Nova Scotia, via St. John's, Newfoundland, to London, England at flight level (FL) 410. The number one engine spooled down, and a high exhaust gas temperature was noted. The engine was shut down, and the flight diverted to Shannon, Ireland where an uneventful single-engine landing was made. The flight time on one engine was 50 minutes.

Aer Lingus maintenance personnel at Shannon inspected the engine for damage, but this initial inspection did not reveal any damage to the compressor blades. Suspecting a fuel pump main stage failure, the fuel pump and fuel control unit (FCU) were changed. A full-power engine run-up was successfully carried out, indicating normal operation of the engine, and the aircraft was released for a ferry flight to Toronto, Ontario.

During the ferry flight, while climbing through FL 313, the number one engine experienced a momentary surge; all engine parameters before and after the surge were normal. The aircraft returned to Shannon, and Air Canada personnel conducted a borescope inspection of the number one engine compressor, which revealed massive high pressure compressor damage. 4040

When the engine was disassembled, most of the blades in the fifth stage compressor assembly were found to have foreign object damage (FOD). Thirteen minor nicks were also found on the trailing edges of the variable inlet guide vanes. The first broken blade was found on stage seven. The heaviest damage occurred in the eighth and ninth stages, where several blades were liberated and where the vanes had partially disintegrated. The nicks and tears on the blades and vanes had a circular impact pattern of approximately the diameter of a 12-point bolt; this type of bolt is used in the buildup of the engine.

Inspection of the compressor revealed blades and vanes at various stages of failure progression; some of the vanes were broken off and jammed between the inner and outer shrouds. The failure pattern indicated that compressor blade damage due to FOD had occurred sometime prior to the first engine surge. This observation was based on the presence of dull nicks and airflow-induced dirt deposits on the nicked blades. The failure of the blades and vanes showed a very clear and shiny break surface which indicated fatigue failure originating from the nicks.

The original fuel pump was tested, and it passed the performance test without adjustment or repair. The original FCU was installed on an engine for a test cell run, and it operated within acceptable limits.

The initial compressor damage was the result of FOD, probably a bolt, which entered the engine. This occurred at some time prior to the first engine problem and resulted in the later fatigue failure of the vanes and blades.

During the flight from St. John's to London, a nicked blade, most likely in stage seven, suffered fatigue failure, and, when it separated, it caused the engine to spool down. On departure for the intended ferry flight to Toronto, further blade and vane failures occurred, causing the engine to surge. Following this incident, Air Canada introduced routine post-test compressor borescope inspections to reduce the possibility of similar failures.

FINDINGS:

Cause Related:

1. The initial inspection by Aer Lingus did not reveal any damage to the compressor blades.

2. The initial engine damage was a result of foreign object damage.

3. The engine spool down and compressor surge occurred when blades and vanes were liberated because of fatigue failure.

Other:

-Nil-

* * *

AUSTIN AIRWAYS LIMITED
BEECH C99 AIRLINER C-GGLE
HORNEPAYNE, ONTARIO
02 MARCH 1987

REPORT NUMBER: 87-O/70014 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1730 EST
OPERATION: Regular Specific Point
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	11,000	1,500	8,000	21
LAST 90 DAYS	260	260	270	21

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	5

HISTORY OF THE FLIGHT:

The crew completed a non-precision instrument approach and made a normal landing, slightly to the left of centre on the snow-covered runway. Shortly after touchdown, the aircraft began to drift to the left, and the left main landing gear entered a wind-row of snow located along the southern edge of the runway. The aircraft veered sharply to the left, and the nose gear collapsed as the aircraft slid to a stop off the runway. The crew and passengers then exited the aircraft.

PERTINENT INFORMATION:

While en route to Hornepayne, Ontario, the crew was advised by their company dispatcher that there was a wind-row of snow along the southern edge of runway 25. Prior to landing, the airport manager also provided the crew with the current weather and runway condition; he did not mention the wind-row, as he had already passed this information to the company dispatcher. The crew neither requested nor were they informed when the runway had last been cleaned. The airport manager reported that the runway condition was snow covered with about one inch of snow on the north side of the runway and one and one-half inches of snow on the south side. These depths of snow were based on visual estimates by the airport manager. No actual measurements of snow depth on the runway were taken.

The airport manager, who was alone on duty, had last cleaned the runway at 0730 hours that morning, 10 hours before the accident. A wind-row about 18 inches high was left adjacent and parallel to the southern edge of the runway. The wind-row was to be removed when time permitted.

Extensive snow showers, associated with a trough and low pressure system, were observed throughout the region. About two hours before the aircraft arrived, the ground visibility at the airport was reduced to a quarter mile in heavy snow and was reported as one mile in light snow when the aircraft landed. The wind was predominantly from 300 degrees magnetic, blowing across the runway towards the wind-row at eight knots.

The runway at Hornepayne is paved asphalt, 3,500 feet long and 75 feet wide. The runway identification lights are about five feet back from the edge of the asphalt. No runway markings were visible under the snow cover.

After the aircraft came to a stop, the passengers were unable to open the rear cabin door until assisted by another company pilot who was a non-revenue passenger on the flight. The correct door opening procedure was not followed, although the instructions were clearly marked on the door itself and also on the aircraft information card available to every passenger. When the crew and passengers exited the aircraft, they visually observed the depth of snow on the left side of the runway to be about three to four inches.

ANALYSIS:

Although aware of the wind-row, the crew did not know that the runway had last been cleared at 0730 that morning. In the interim period between the runway clearing and the arrival of the aircraft, snow showers reduced the ground visibility in light to heavy snow. In addition, the northwest wind blowing across the runway, towards the wind-row, resulted in a greater accumulation of snow on the left side of runway 25, as well as creating a cross-wind landing condition.

When the aircraft landed slightly left of centre on the snow-covered runway, the combination of the depth of snow and cross-wind from the right resulted in the aircraft drifting to the left. The crew was unable to prevent the aircraft's left landing gear from entering the wind-row located along the left edge of the runway. Once this occurred, the aircraft veered sharply to the left and slid off the runway.

The egress from the aircraft was momentarily delayed since the passengers were unable to perform the door opening sequence. The opening instructions were simple and clearly visible on the rear cabin door and also on the aircraft information card. The passengers had not familiarized themselves with this procedure.

FINDINGS:

Cause Related:
1. The depth of snow on the runway combined with the cross-wind landing conditions were sufficient to cause a loss of directional control after landing.

2. After the aircraft began a drift to the left on the narrow snow-covered runway, the crew was unable to regain directional control of the aircraft in the space available before the gear entered the wind-row.

Other:
1. The egress from the aircraft was delayed because the passengers were unfamiliar with the correct rear cabin door opening procedure.

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BUSH LAND AIRWAYS
CESSNA 180C SKYWAGON C-FIWD
RUPERT RIVER, QUÉBEC 18 mi SW
02 MARCH 1987

BRIEF NUMBER: 87-Q70003 (Accident)
LOCAL TIME: 1512 EST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,000	900
LAST 90 DAYS	130	26

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot with two passengers on board was en route to a hunting camp and was landing on a frozen lake. The visibility was 10 miles, but an overcast ceiling and the snow conditions created a situation whereby depth perception was very difficult. The pilot, aware that the lake surface was known to be rough, with some small snow-drifts, conducted the approach so that the aircraft touched down in a three-point attitude. Immediately after landing, the ski-equipped aircraft struck a small snow- drift which broke the tail ski check cable, allowing the tail ski to dig in and turn sideways. The aircraft turned sideways and struck another snow-drift. The right main gear collapsed, allowing the right wing and the propeller to contact the surface.

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SABOURIN AIRWAYS LTD.
PIPER PA-31 NAVAJO C-GHMG
RED LAKE, ONTARIO
31 MARCH 1987

BRIEF NUMBER: 87-C70011 (Accident)
LOCAL TIME: 1854 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	15,000	1,800
LAST 90 DAYS	175	165

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

Prior to landing, the pilot activated the landing gear but did not ensure that the gear lever was all the way down. The aircraft was landed with the wheels retracted.

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AIR DORVAL LTÉE
SWEARINGEN MERLIN IV SA 226 AT C-GDEF
TROIS-RIVIÈRES, QUÉBEC 70 nm NE
10 APRIL 1987

REPORT NUMBER: 87-Q74034 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1900 CST
OPERATION: Charter
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	2,960	235	N/A	N/A
LAST 90 DAYS	285	140	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	12

SUMMARY REPORT:

The aircraft was on a charter flight from Bagotville, Québec to Montréal/Dorval Airport with 14 people on board. While the aircraft was at cruise speed, at an altitude of 14,000 feet and 70 miles from destination, the left engine (Air Research TPE 331-34-303G) lost oil pressure, and the left propeller became erratic. The pilot feathered the propeller, shut down the engine, and declared an emergency. Crash Fire Fighting and Rescue Services (CFR) equipment was made available, but the aircraft landed without further incident at Dorval Airport. No one was injured.

An engine inspection by company personnel showed that a spur gear shaft was broken in the torque sensor unit. Examination by the CASB Engineering Laboratory revealed that the spur gear shaft had fractured as a result of the overload extension of an extensive fatigue pre-crack. The cause of the fatigue cracking could not be determined. It was also noted that the width of the contact area of the spur gear shaft was less than the width specified in the engineering drawing; however, the failure of the shaft was not related to this discrepancy.

Prior to this incident, an Airworthiness Directive (AD) and several Service Bulletins (SB) had been issued concerning problems related to the torque sensor assembly system of this engine; one of the bulletins, SB number TPE/TSE 331-72-0412, warned that the torque sensor spur gear shaft retaining key can be improperly positioned during installation. At the time of the occurrence, all mandatory ADs had been complied with. This engine had approximately 30 hours of flight time since new, out of a possible total time between overhauls (TBO) of 3,600 hours.

The failure of the torque sensor spur gear shaft caused the engine to lose oil pressure. As a result of this, the propeller became erratic, and the pilot was compelled to feather the propeller and shut down the engine.

CONCLUSIONS:

Findings:
1. The engine torque sensor spur gear shaft broke as a result of the overload extension of an extensive fatigue pre-crack.

2. Engine oil pressure was lost, and the propeller became erratic.

3. The pilot feathered the propeller and shut down the engine.

4. The width of the contact area of the spur gear shaft was less than the width specified in the engineering drawing.

Causes:
The torque sensor spur gear shaft broke.

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LABRADOR AIRWAYS
DE HAVILLAND DHC-3 OTTER C-GNLA
NAIN, NEWFOUNDLAND
20 APRIL 1987

BRIEF NUMBER: 87-A70009 (Accident)
LOCAL TIME: 1920 NST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	18,500	1,600
LAST 90 DAYS	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The aircraft took off from the ice which covered Nain harbour and which was overlaid with six to eight inches of water. After the flight, the pilot raised the skis for a landing on the airstrip at Nain. Following a normal touchdown, when the pilot applied the brakes, the aircraft veered left and started to nose over. He applied opposite brake to avoid going off the edge of the airstrip, but the aircraft continued to nose over. The pilot shut down the engine, and, just as the engine stopped, the propeller hit the gravel. The aircraft came to a stop in a nose-down attitude and then fell down hard onto its tail.

The temperature on landing was about zero degrees Celsius, and the apparent brake malfunction may have been caused by ice accumulation in the wheel brake assemblies.

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AIR SAHTU LTD.
BEECHCRAFT C18S C-FMBO
FORT FRANKLIN, NORTHWEST TERRITORIES
15 mi ESE
07 MAY 1987

REPORT NUMBER: 87-W70023
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1530 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	20,000	3,000
LAST 90 DAYS	150	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	1	8

HISTORY OF THE FLIGHT:

The aircraft had been chartered by a Band Council at Rae Lakes, Northwest Territories (NWT) for the purpose of transporting nine residents to Fort Franklin, NWT. About 75 miles short of Fort Franklin, the right engine lost oil pressure. The pilot reduced the power and continued the flight at a reduced airspeed. The aircraft was within 20 miles of Fort Franklin when a severe vibration from the right engine made the aircraft almost uncontrollable. The pilot shut down the right engine and force-landed the aircraft on the ice of Great Bear Lake. The pilot and passengers were rescued by snowmobiles three hours later.

PERTINENT INFORMATION:

The engines were equipped with non-feathering propellers. When oil pressure was lost on the right engine, the pilot operated the engine at reduced power rather than shut it down. When the engine was shut down, following the severe vibratin, the propeller was then windmilling.

Fort Franklin was reported to have a 1,000-foot cloud base with three miles visibility. The pilot had a good radio bearing from Fort Franklin and continued toward his destination.

Before the aircraft left Fort Franklin, each engine oil tank reportedly contained six gallons and indicated full. The pilot added four quarts to the right engine at Rae Lakes. The company did not keep a record of engine oil consumption.

Damage to the right engine was found to be consistent with a lack of lubrication. Damage to the right propeller indicated that no power was being developed at touchdown. The right oil tank contained no usable oil, and the fuselage and firewall did not indicate any signs of oil leakage during flight.

The authorized maximum gross weight of the aircraft is 7,850 pounds; the weight of the aircraft on take-off for the accident flight was 8,509 pounds. The company ahd been operating the aircraft to an apparent maximum gross weight of 8,750 pounds; aircraft records had been altered by persons unknown to indicate the higher than normal weight. the CASB could not determine when the records were altered.

ANALYSIS:

The lack of lubrication in the right engine caused the right engine to fail. Because the propeller was non-feathering, it could not be feathered to reduce drag. The drag caused by the windmilling propeller and the weight of the aircraft resulted in the forced landing.

The company did not keep a record of engine oil consumption, but the pilot reported that four quarts of oil wre used on the flight to Rae Lakes, and apparently all six gallons were used on the return flight. The reason for the high rate of oil consumption could not be determined.

FINDINGS:

Cause Related:

1. The right engine failed because of a lack of lubrication.

2. The aircraft was operating above maximum gross weight. Aircraft records had been altered by persons unknown to indicate the higher than authorized weight.

3. Because of the aircraft weight and the windmilling right propeller, the aircraft was not able to maintain altitude.

Other:

1. The company did not keep a record of engine oil consumption.

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COVAL AIR LTD.
DEHAVILLAND DHC-2 BEAVER C-FICK
KELSEY BAY, BRITISH COLUMBIA
14 MAY 1987

REPORT NUMBER: 87-P70024 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1405 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,501	1,378
LAST 90 DAYS	214	61

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The float-equipped Beaver landed up-river at Kelsey Bay, into a 8-to-10-knot wind, in order to drop off two passengers. With the three remaining passengers on board, the aircraft left the dock and began a take-off downwind, back toward the river mouth. The aircraft had just become airborne when the left float struck the top of the riverbank. The left float was damaged, and the pilot made a gentle turn to the left to land the unstable aircraft up-wind in a shallow part of the river. When the damaged float touched the water, it broke off, and the aircraft pitched nose-down into about four feet of water. The uninjured occupants exited the aircraft.

Because of the tall trees and mountainous terrain on both sides of the river, it is normal procedure to take off toward the open bay no matter what the direction of the prevailing wind. There is a distance of 900 feet from the dock to a bend in the river where the river turns 25 degrees to the right. At this point, the riverbanks are about four feet high, and the current flows toward the left bank.

The pilot experienced difficulty maintaining directional control; however, there were no mechanical problems found which would affect the controllability of the aircraft. On take-off, the Beaver aircraft requires considerable right rudder to counteract the effects of engine torque at low airspeeds.

The effects of engine torque, combined with the tail wind and the current, made turning to the right more difficult. In the circumstances, the 900-foot space selected by the pilot for take-off was insufficient.

The seats in this aircraft had been modified to give them more rigidity by installing a triangular piece of aluminum between the seat/floor attachment points. This modification helped ensure that the seats stayed in their floor sockets.

FINDINGS:

Cause Related:

1. The take-off distance was insufficient to allow the aircraft to become airborne before reaching the riverbank.

2. The pilot was unable to manoeuvre the aircraft around the river bend because of the combination of tail wind, river current, and engine torque.

Other:

1. All the seats remained attached to the floor, due in part to a modification which increased the rigidity of the seats.

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AKLAK AIR
CESSNA 185 SKYWAGON C-FQXR
ANDERSON RIVER, NORTHWEST TERRITORIES
15 MAY 1987

BRIEF NUMBER: 87-W70027 (Accident)
LOCAL TIME: 2015 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,800	1,500
LAST 90 DAYS	270	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot was flying two hunters to the Anderson River. The ice area selected for a landing was smooth and covered with a light dusting of snow. After touchdown, the aircraft was not decelerating, and, in an attempt to avoid some snow drifts, the pilot turned the aircraft to the left. The aircraft began to slide to the right, and the right main gear leg collapsed. The pilot did not attempt to overshoot because a hill on the shoreline obstructed his departure path.

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EDMONTON FLYING CLUB
CESSNA 210 CENTURION C-GBKB
EDMONTON, ALBERTA
22 MAY 1987

REPORT NUMBER: 87-W70029 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1555 MDT
OPERATION: Charter
DAMAGE: Destroyed
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,100	5
LAST 90 DAYS	60	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

SUMMARY REPORT:

The aircraft was joining the circuit at Edmonton Municipal Airport at the end of visual flight rules (VFR) flight. The pilot advanced the throttle to decrease the rate of descent, but the engine went to idle rpm. The pilot started a 180-degree turn to make a forced landing on a turf-covered field when the right wing tip struck the ground, and the aircraft swerved to the right. As the aircraft skidded to a stop, the left main gear collapsed, and the engine became partly separated from the fuselage. Moments after the occupants escaped from the aircraft, spilling fuel ignited, and the aircraft was destroyed by fire.

Examination of the engine revealed that the throttle control was disconnected from the throttle lever and that the hole in the throttle lever was enlarged and opened through the side of the lever. Laboratory examination of the throttle lever determined that vibration of a loose knurled bushing in the lever had caused rapid wear and separation of the control. The bushing became loose for undetermined reasons. Although a new throttle control was installed 20 flight hours prior to this failure, there was no evidence to suggest that this condition existed at that time.

The area selected for the forced landing was suitable, but it was bordered by a ploughed field. In an attempt to land on the turf instead of the ploughed area, the pilot continued in a right turn until ground contact, which resulted in the crash and ensuing fire.

FINDINGS:

Cause Related:

1. The engine lost power because the throttle control became disconnected from the throttle lever, as a result of severe wear of the throttle lever.

2. The wear of the throttle lever occurred when the knurled bushing became loose for undetermined reasons.

3. The pilot misjudged his forced landing approach to the turf field and was still in a right turn at touchdown.

4. The aircraft was destroyed by fire when uncontained fuel was ignited.

Other:
-Nil-

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POWELL AIR LTD.
CESSNA U206E C-GUSU
BUTE INLET, BRITISH COLUMBIA
27 MAY 1987

REPORT NUMBER: 87-P70028 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1345 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,500	3
LAST 90 DAYS	220	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The pilot and four passengers departed from Powell Lake, British Columbia at 0825 Pacific daylight time (PDT) for a flight to Bute Inlet, British Columbia. On arrival, the passengers were dropped off at various points in the inlet to check on logging operations. The pilot waited at the dock or offshore as required, to move the passengers to the various locations. Gusty winds and tidal currents produced choppy waves that occasionally required the pilot to taxi for long distances to reach sheltered areas in the lee of points of land in order to take-off. On several occasions the aircraft was beached on rocky shores.

At 1330 PDT, the pilot picked up three of the passengers near Ward Point and began to taxi to a sheltered area behind the point in order to take-off. While they were taxiing, the passenger in the right front seat advised the pilot that the right float appeared to be low in the water. The pilot assumed that this was due to the quartering tail wind from the left, but, a short time later, the same passenger stated that the float was getting lower in the water; the pilot then turned the aircraft toward the shore and applied power, hoping to get the aircraft up on the step and beach it on the shore. The increased speed drove the float further under the water, and the propeller began to strike the water. The pilot then shut off the engine and ordered the passengers to don life-jackets and to abandon the aircraft; as they did so, the aircraft rolled over slowly to the right and sank to the floats about 50 feet from shore. One of the passengers, while standing on the floats, sent out a MAYDAY call on a hand-held radio. The wind blew the inverted aircraft toward the shore until it grounded, and the pilot and passengers swam the remaining distance to the shore where they were picked up by a Search and Rescue helicopter an hour and a half later. A Coast Guard boat, which was dispatched to the scene, towed the aircraft several miles to an area where there was equipment available to salvage it.

Each float has six compartments, and, after salvage, it was found that the number two (from the front) compartment of the right float had been holed. The hole was about one inch in diameter with cracks up to six inches long radiating from the hole. The third compartment could be used as a cargo compartment and was equipped with a hinged lid with two fasteners opposite the hinged side. Although the lid was designed to close on a gasket, the gasket was missing.

The type and position of the hole in the right float indicates that the float had bounced on a rock or other hard object, probably while the aircraft was beached or being beached earlier. With the number two compartment flooded, there was still sufficient bouyancy to support the aircraft with only the pilot on board; however, when the three passengers boarded, the float sank deeper into the water. When the aircraft was taxied, water splashed over the nearly submerged right float and, because the gasket of the cargo lid was missing, water filled the third compartment. With two compartments flooded, the float could not support the weight of the aircraft, and it rolled over.

FINDINGS:

Cause Related:

1. The number two compartment of the right float was holed from bouncing on rocks during beaching operations, and it became flooded.

2. The number three compartment of the right float flooded because the gasket which seals the storage compartment cover was missing.

3. The pilot did not become aware of the problem with the sinking float in sufficient time to take corrective action.

Other:
-Nil-

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NORTH YUKON AIR LTD.
CESSNA A185F SKYWAGON C-GZJO
CROW FLATS, YUKON
30 MAY 1987

BRIEF NUMBER: 87-W70032 (Accident)
LOCAL TIME: 0200 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,000	N/A
LAST 90 DAYS	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot had landed the wheel/ski equipped aircraft with the skis extended on a frozen lake. While turning around, the aircraft drifted sideways, and a ski caught on a crack in the ice. The aircraft tipped onto its left wing tip and stabilizer, then righted itself. The wind was blowing at 15 to 20 knots.

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WILDERNESS AIRLINES (1975) LTD.
CESSNA 185F SKYWAGON C-GIXJ
OWIKENO VILLAGE, BRITISH COLUMBIA
10 JUNE 1987

REPORT NUMBER: 87-P70033 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0940 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,850	400
LAST 90 DAYS	220	140

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The float-equipped aircraft carrying the pilot, three passengers, and 20 pounds of baggage commenced a downriver downwind take-off from Owikeno Village, British Columbia. As the aircraft negotiated a bend of 20 degrees to the left at a speed of 50 knots, the right wing tip contacted bush on the shoreline. The aircraft swung to the right into the shoreline and came to rest facing in the opposite direction from the take-off path and 75 feet downstream from the point of contact with the bush. The occupants all escaped without injury.

The weather was suitable for visual flight rules (VFR) flight, and the wind was from 135 degrees magnetic (M) at 10 knots, with frequent gusts. The river is flowing in the direction of 330 degrees M with the current flowing at 15 knots. The take-off was attempted downstream on a heading of 330 degrees M with a tail wind. The distance from the Owikeno Village dock to the 20-degree bend is approximately 4,000 feet.

The aircraft was at maximum gross weight for the take-off, and the centre of gravity was within limits.

Normally 4,000 feet is sufficient distance for a Cessna 185 on floats at gross weight to take off; however, while the aircraft was being turned around from the dock and prepared for take-off, the strong river current and gusty tail wind carried the aircraft downriver some distance, thus reducing the distance available for take-off. The current also carried the aircraft toward the right shoreline at the river bend. As a result, the aircraft was unable to take off before reaching the bend and could not avoid striking the shoreline.

FINDINGS:

Cause Related:
1. The take-off was attempted downstream on a heading of 330 degrees with a tail wind.

2. The aircraft did not become airborne before the river bend, and it struck the bush on the shore.

Other:
-Nil-

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AIR NOOTKA LTD.
DEHAVILLAND DHC-2 BEAVER C-FHXX
CHAMISS BAY, BRITISH COLUMBIA
11 JUNE 1987

REPORT NUMBER: 87-P70034 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0920 PDT
OPERATION: Scheduled Domestic
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,052	2,000
LAST 90 DAYS	279	175

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The float-equipped aircraft took off from Tahsis, British Columbia bound for Chamiss Bay with the pilot, one passenger, and 360 pounds of freight on board. On landing at Chamis Bay, the pilot heard a sudden snap from the right rear float strut area. He added power to remain on the step and pilot the aircraft to shore. However, the aircraft settled to the right, and the right wing tip entered the water. The pilot and passenger were rescued by persons in a tug boat. While the aircraft was being towed to shore, it overturned.

The wind was from the southwest at 30 knots and gusting. Visibility was three miles in rain showers with a 500-foot overcast sky condition. The temperature was about eight degrees Celsius.

The landing was made in the relative shelter of Chamiss Bay; there was a swell with an 18-inch chop and white-caps on the water. The pilot made his approach into wind at 70 knots indicated airspeed with 30 degrees of flap selected. He reported that the aircraft made a hard landing when it dropped from about 10 feet as a gust subsided.

The strong gusting wind and rough sea combined to make the landing hazardous, and a float support failed during the hard landing.

FINDINGS:

Cause Related:
1. The pilot landed the aircraft in strong gusting wind and rough sea conditions.

2. A hard landing ensued which caused a float support to fail.

Other:
-Nil-

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WETASKIWIN AIR SERVICES LTD.
CESSNA 177B CARDINAL C-GXFY
RAYMOND, ALBERTA 12 mi S
12 JUNE 1987

REPORT NUMBER: 87-W74055 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0945 MDT
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,950	600
LAST 90 DAYS	200	37

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

While in level cruise flight, the pilot felt a sudden, severe vibration. The engine was shut down, and a successful forced landing was conducted in a farm field. It was determined that approximately eight inches of propeller blade had broken off in flight. The severe vibration resulted in damage to the engine, engine mount, instruments, and radios.

Examination of the propeller blade by the CASB Engineering Branch indicated that the blade had failed because of a fatigue fracture. The origin of the fatigue fracture was determined to be a previously dressed area on the blade leading edge. No inherent metallurgical deficiencies which could have played a role in the failure were detected.

FINDINGS:

Cause Related:
1. A fatigue crack in a previously dressed area of the blade resulted in the loss of the blade tip.

Other:
-Nil-

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ATHABASKA AIRWAYS LTD.
DE HAVILLAND DHC-6-100 TWIN OTTER
C-FWGE
MAWDSLEY LAKE, SASKATCHEWAN
13 JUNE 1987

REPORT NUMBER: 87-C70034
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1300 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,494	440
LAST 90 DAYS	276	269

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	7

HISTORY OF THE FLIGHT:

The passenger charter flight from La Ronge to Mawdsley Lake, Saskatchewan was normal. The approach to land was made into strong, gusty winds, close to and toward the shoreline to avoid rougher water further out. The approach was normal, but the aircraft bounced on touchdown, approximately 1,000 feet from shore. The pilot applied power to overshoot and raised the flaps from 30 to 10 degrees. The aircraft did not climb as expected, and the pilot applied full power. The aircraft struck trees as it crossed the shoreline, then travelled approximately 185 feet, turned abruptly to the right, and crashed into trees.

PERTINENT INFORMATION:

No aircraft malfunctions were reported or discovered during the course of the investigation. Both engines were serviceable and operating. The weight and centre of gravity were within the prescribed limits at the time of the accident.

The weather was suitable for the flight, but strong, gusty winds prevailed over the area. The nearest weather observing stations were reporting winds from the west at 16 gusting to 33 knots. Observers at Mawdsley Lake noted the winds to be strong and gusty. The lake surface was very rough, but less so in the lee of the shoreline.

The pilot elected to land into wind, perpendicular to the shoreline, and the touchdown point was close to the shoreline to take advantage of the calmer waters.

The pilot's seat was equipped with a shoulder harness, but he was not wearing it as it was unserviceable. The passenger seats fitted were the standard for this type of aircraft. The seats can be folded against the cabin wall to create space for freight. A passenger, who was seated immediately behind a folded seat and wearing a seat-belt, struck his head on the folded seat immediately in front of him and suffered a laceration to his forehead.

ANALYSIS:

Given the conditions, the pilot landed the aircraft too close to the shore to allow for a safe overshoot. During the overshoot, as the aircraft travelled towards the shoreline, it encountered less severe winds in the lee of the land and also downdrafts caused by the wind passing from the treed shoreline over the lake. Thus, the aircraft's airspeed decreased as the aircraft flew into descending air, causing the climb performance to be degraded. When the aircraft did not climb as expected, the pilot applied full power, but there was insufficient distance remaining to clear the trees safely.

CONCLUSIONS:

Findings:
1. The pilot selected a touchdown point toward and close to the shoreline to land into wind and avoid rough water further out.

2. The pilot did not immediately apply full power on the overshoot.

3. The aircraft did not climb as expected due to less severe winds in the lee of the shore and downdraft conditions.

4. A passenger suffered an injury when his head struck a folded seat in front of him.

5. The pilot's shoulder harness was unserviceable.

Causes:
The touchdown point was too close to the shore to allow for a safe overshoot.

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CENTRAL MOUNTAIN AIR SERVICES
BEECH D18S C-GTPY
BRONSON CREEK AIRSTRIP, BRITISH COLUMBIA
14 JUNE 1987

REPORT NO: 87-P70036
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1200 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,300	175
LAST 90 DAYS	175	140

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

HISTORY OF THE FLIGHT:

The pilot of the Beech D18S aircraft was transporting a passenger and 1,000 pounds of freight from Smithers, British Columbia to the airstrip at Bronson Creek, British Columbia. During the landing roll-out at Bronson Creek, the left main wheel folded rearwards into the wheel well, causing the aircraft to settle onto its left wing and ground loop. The right wheel broke away from the gear leg, and the aircraft skidded to a stop on the fuselage.

PERTINENT INFORMATION:

The pilot was qualified for the flight. He had landed at Bronson Creek airstrip a number of times in recent weeks, each time with the same aircraft which was fully loaded.

The Bronson Creek airstrip is a bulldozed clearing, 2,000 feet long and 100 feet wide, lined by tall trees. The runway surface is a combination of sand and gravel with embedded rocks up to six inches in diameter. The touchdown area is poorly drained, soft, deeply rutted, and uneven from use. Maintenance done on the runway had not corrected the problems, and the runway was not suitable for aircraft of this weight.

The weather at the time of the occurrence was not a factor; the wind was light and favoured the landing runway.

When the aircraft was examined, it was found that the left main landing gear lift leg assembly (part number 404-188405-600) was not attached to the gear leg. The attaching bolt (part number NAS 149A-74) was missing and could not be found. The bolt is normally retained by a nut and cotter pin, and it had to be in place to enable the pilot to lower the landing gear. Witness marks on the landing gear leg and lift leg assembly indicate that the two had been jammed together with force after the attaching bolt came out of its fitting. The top end of the lift leg assembly was broken in overload when the free end dug into the ground.

Because the attaching bolt could not be found, it could not be determined how it had separated. The lift leg assembly was examined during the aircraft's last 100-hour inspection, and the aircraft had since flown 47. 2 hours. The attaching bolt was examined for cracks by magnaflux, 456 flying hours before the accident. There were no discrepancies found during either inspection.

ANALYSIS:

The left main gear lift leg assembly became detached from the left gear leg, causing the left main gear to collapse when the aircraft landed. The bolt attaching the lift leg to the gear leg was missing for undetermined reasons.

FINDINGS:

Cause Related
1. The aircraft's left lift leg attaching bolt separated from its fitting for undetermined reasons.

Other:
1. The Bronson Creek airstrip was not in suitable condition for use by this type of aircraft.

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AQUILA AIR LTD.
CESSNA 172N SKYHAWK C-GJPA
MOH CREEK, BRITISH COLUMBIA
22 JUNE 1987

REPORT NUMBER: 87-P70040 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1830 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	400	400
LAST 90 DAYS	190	190

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot and two passengers arrived at Moh Creek, British Columbia from Qualicum, British Columbia, after a one hour flight. The pilot flew a visual circuit to land to the east on the 1,900-foot gravel runway. On landing, the aircraft touched down 1,100 feet from the threshold, skipped over a distance of 100 feet, and landed again. The pilot applied the brakes, and the aircraft skidded along the remaining 700 feet of runway and went off the end. The aircraft fell down a steep embankment and came to a stop 200 feet beyond the end of the runway. The pilot and the front-seat passenger received minor injuries; neither was wearing the available shoulder harnesses.

The weather was suitable for the flight, and the light wind favoured the landing runway. There was no evidence of an aircraft system malfunction, and the weight and centre of gravity were within the prescribed limits.

The approach to the airstrip is unobstructed. The pilot had flown into the Moh Creek Airstrip and similar airstrips numerous times in the two-month period that he was employed by the company; he had flown in and out with a Cessna 206 on the morning of the accident. The Cessna 172 pilot's manual recommends that 40 degrees of flap be selected and an airspeed of 69 mph be established on final approach for a short-field landing. Engine power is used to control the aircraft's rate of descent. On this occasion, the pilot stated that he approached with 30 degrees of flap at an airspeed of 70 mph. He extended the flaps to 40 degrees when the aircraft crossed the threshold, and, as the flaps were extended, the aircraft ballooned.

The pilot's approach technique was inappropriate for the runway length available. When it became obvious that the aircraft would have only about 700 feet of runway on which to stop, the pilot did not attempt an overshoot; as a result, the aircraft ran off the end of the runway.

FINDINGS:

Cause Related:

1. The pilot's approach technique was inappropriate for the runway's length.

2. The pilot did not attempt an overshoot when it became obvious that the aircraft would land long; as a result, the aircraft ran off the end of the runway.

Other:

1. The available shoulder harnesses were not worn by the pilot and the front-seat passenger; both received minor injuries.

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AIR TORO INC.
DE HAVILLAND DHC-2 BEAVER C-GDZE
LAKE MONDONAC, QUÉBEC
24 JUNE 1987

REPORT NUMBER: 87-H70002

	Pilot-In-Command
Pilot Licence	Commercial
Total Flying Time	625 hr (estimated)
Total on Type	85 hr (estimated)
Total Last 90 Days	20 hr (estimated)

Injuries:	Crew	Passengers	Other	Total
Fatal	1	3	-	4
Serious	-	1	-	1
Minor/None	-	-	-	-
Total	1	4	-	5

HISTORY OF THE FLIGHT:

On 24 June 1987, the pilot of the float-equipped DHC-2 Beaver departed the company's base in St. Ignace-du-Lac for a one and a half hour visual flight rules (VFR) flight to transport four fishermen and their equipment to Lake Garancière, 103 nautical miles to the north northwest.

Following take-off, the aircraft climbed and levelled off at approximately 2,000 feet above sea level (asl), approximately 900 feet above ground level (agl). After the aircraft had levelled off, the passenger, who was sitting next to the pilot and who had flown in a Beaver aircraft on three occasions, noticed that the aircraft was flying in a slightly nose-up attitude. The nose-up attitude of the aircraft was such that it prevented the passenger from seeing the horizon out the front window without leaning forward. The surviving passenger stated that the aircraft was also flying in a slightly right-wing-down attitude.

Nearing Lake Mondonac, the pilot commenced a series of turns. During these manoeuvres, the passenger noticed that the altimeter was reading 1,700 feet asl and estimated that the aircraft was flying between 200 and 300 feet agl.

The aircraft descended and struck the ground in a steep nose-down, left-wing-low attitude. The aircraft was destroyed by the impact, and the wreckage was consumed by a signal fire which was started by the surviving passenger approximately six hours after the accident. The crash occurred 42 nautical miles north northwest of St. Ignace-du-Lac and one-quarter mile west of Lake Mondonac.

The accident occurred at lat 47°25'N, long 74°00'W at approximately 1230 EDT during the hours of daylight, at an elevation of 1,375 feet asl.

PERTINENT INFORMATION:

The company's operation manual did not include the weight and balance forms for the Beaver at the time Transport Canada amended the operator's Operating Certificate (OC) for the operation of the aircraft. Following a base inspection in June 1985 by Transport Canada's Air Carrier personnel, Air Toro Inc. was informed in writing that sample forms were required to ensure that the weight and balance of the company's two aircraft were within limits. The company owner did not respond to this request, and there was no follow-up by Transport Canada.

According to Transport Canada's air carrier flight operations rating system, Air Toro Inc. met most requirements, but corrective action in the following areas was required within a specific time frame as a result of the base inspection in August 1986:

— It was noted by Air Carrier personnel that the flight and ground training of the two pilots at the beginning of the season could be more "serious. " According to the base inspection document, each company pilot had completed one hour of flight training in May 1986.

— The company documents were reviewed by Air Carrier personnel, and the company operations manual needed to be amended. There was no weight and balance form available for the Beaver. It was also noted that records of the pilots' licences, medical validation certificates, and initial and recurrent training had to be maintained.

— The record keeping for the carriage of dangerous goods needed improvement.

— The company was informed in writing to rectify the discrepancies and to detail in writing the corrective actions taken before 30 September 1986. There was no mention in Transport Canada's letter to the company that the record keeping for the carriage of dangerous goods needed to be improved.

The pilot/owner replied to Transport Canada in writing in October that he had complied with the request following the last base inspection. There was no mention of how each discrepancy was resolved, nor were any copies of the weight and balance forms for the DHC-2 sent for examination by Transport Canada officials. There was no follow-up by Transport Canada.

ANALYSIS:

While proceeding en route and for reasons not expressed to the passengers, the pilot deviated from the planned flight and began manoeuvring the aircraft close to the ground. The impact attitude and the nature of the damage to the aircraft indicate that, during this manoeuvring, the aircraft stalled and entered a spin at an altitude from which a recovery could not be effected.

The investigation was principally concerned with determining the reason for the deviation from the intended flight and the subsequent stall. Particular attention was paid to the pre-impact condition of the aircraft, the weight and centre of gravity, and the aircraft flight profile. Also examined were certain aspects of the company's operations, the regulatory surveillance, and the adequacy of the aircraft restraint systems.

There was no evidence of any pre-impact structural failure or aircraft system malfunction. All observed damage to the aircraft was directly attributable to tree and ground impact and the post-impact fire. Examination of the engine and propeller determined that the engine was in good condition and capable of producing power. Evidence indicated that sufficient fuel for the planned flight had been boarded. The extent and duration of the post-impact fire confirmed that a significant amount of fuel was on board the aircraft at the time of the accident.

Examination of the wreckage did, however, reveal the presence of a pre-existing crack near a keel rivet in the aft compartment of the right float. The crack was of sufficient size to permit the seepage of water into the float while the aircraft remained on the water. Although it was not possible to determine the cause of the rupture, the backing of the floats onto the shore to load and unload the aircraft at some of the company's camps may have caused or contributed to the cracking of the keel. This procedure was used at several of the operator's camps including the camp located at Lake Garancière.

Contrary to the company's operation manual, the load control procedures were not followed. Although a weight and balance form had been completed by the pilot prior to commencing the flight, it did not accurately indicate the load on the aircraft.

It was not possible to determine the precise weight of the aircraft load; however, it was estimated that the weight of the aircraft, including the passengers, cargo and fuel, was 5,372 pounds, 388 pounds in excess of that calculated by the pilot and 282 pounds over the maximum authorized take-off weight. It was estimated that the centre of gravity position was located at –6. 52 inches, 0. 42 inches aft of the specified rearmost limit.

Based on the pre-departure observations of the aft section of the right float made by the surviving passenger and the nature of the crack found in the keel of the aft compartment, it was determined by weight and volume testing that there could have been 160 pounds of water in the right rear float section. If this was the case, the aircraft weight at take-off would have been approximately 5,532 pounds, 442 pounds over the maximum allowable take-off weight. The centre of gravity position was calculated to be located at –9. 51 inches, 3. 41 inches aft of the specified rearmost limit.

Based upon this hypothesis and applicable fuel consumption rates and assuming the pilot used the rearmost fuel tanks first, it is estimated that the aircraft weight and centre of gravity position at the time of the accident were 332 pounds over the maximum authorized take-off weight and 2. 92 inches aft of the rearmost limit.

The aircraft would have been the least longitudinally stable immediately after take-off and during climb-out because of the aft location of the centre of gravity. Immediately after take-off, the aircraft would have displayed unusual flight characteristics, and the pitch control would have felt unnaturally sensitive.

The nose-high flight attitude described by the surviving passenger, combined with the nose-down setting of the elevator screw-jack, suggests that the weight and centre of gravity position adversely affected the aircraft flight characteristics.

The right-wing-low attitude of the aircraft described by the surviving passenger is indicative that the weight of the water in the aft compartment of the right float may have caused an imbalance in the load distribution of the aircraft.

It could not be ascertained why the aircraft was not flown at an altitude greater than 2,000 feet asl. Near destination, the terrain elevation in certain areas reached 2,000 feet asl. The altitude at which the aircraft was flown would not have provided a safe clearance above the rising terrain. Although the flap setting selected for the climb and the cruise segment of the flight could not be determined, a flap selection other than that recommended by the manufacturer could have affected the aircraft's climb capabilities, especially with the heavy load and the centre of gravity aft of the specified limit.

The proximity of the accident site to Lake Mondonac, which provided ample space for landing, and the positions/settings at impact of the flaps and propeller pitch indicate that the pilot had configured the aircraft for and was attempting a landing when the aircraft stalled.

It could not be determined why the pilot had selected full carburettor heat. The atmospheric conditions were not conducive to the application of full carburettor heat for cruise or manoeuvring power settings. It is unlikely the aircraft was flown with the carburettor heat control selected to full heat for an extended period of time as a prolonged application of full carburettor heat would likely have caused engine overheating and detonation. The surviving passenger did not report any engine operating irregularities, and the pilot did not give any indication that there was something wrong until the final manoeuvres. The pilot, who appeared to be under a certain amount of pressure during the final manoeuvres, may have selected full carburettor heat because most of his flight experience had been accrued flying the company Cessna 180 which included the selection of full carburettor heat before landing.

It is probable that the aircraft stalled because of control difficulties as a result of the aft location of the centre of gravity.

A number of factors present in this accident indicate that the operating procedures used by the pilot/owner were inadequate.

The pilot, who had not weighed the cargo, had inaccurately filled out a company weight and balance form that did not allow for the calculation of the centre of gravity position. The company carried out a commercial operation with the Beaver without the required liability or passenger insurance as stipulated by subsection 20. 3 of the Air Carrier Regulations. The Technical Log Book did not accurately reflect the hours which had been accrued on the Beaver. Contrary to the company's operation manual, the aircraft was not equipped with the means to communicate with the company's base.

In June 1984, Transport Canada had amended the company's OC to operate the Beaver and did not verify if the weight and balance form for the aircraft was included in the company's operations manual.

There was inadequate follow-up by Transport Canada despite the operator's failure to submit the required weight and balance form for the Beaver following the annual base inspections in 1985 and 1986.

The operator was not informed in writing that corrective action was required in the record keeping for the carriage of dangerous goods, nor was there adequate follow-up of the discrepancies noted by Air Carrier personnel following the company base inspection in August 1986.

Had the pilot's seat-belt system held through impact and had shoulder harnesses been available and used by the front-seat occupants, their injuries would have been reduced. It could not be determined if the injuries sustained by the rear-seat occupants would have been reduced had shoulder harnesses been available and used. The lack of a cargo restraint system may have aggravated the occupants' injuries.

CONCLUSIONS:

Findings:

1. The weight and the centre of gravity of the aircraft exceeded the specified limits.

2. The aircraft's longitudinal stability was reduced.

3. The pilot attempted a precautionary landing for undetermined reasons.

4. The aircraft stalled at a height at which recovery was not possible.

5. The company load-control procedures were inadequate.

6. A crack in the keel of the aft compartment of the right float permitted water to seep into the float compartment.

7. Had the pilot's seat-belt system held through impact and had shoulder harnesses been available and used by the front-seat occupants, their injuries would have been reduced.

8. The lack of a cargo restraint system may have aggravated the occupants' injuries.

9. The company did not provide the occupants with information about the emergency equipment on board the aircraft, as required by ANO VII, No 3.

10. Contrary to subsection 20. 4(1) of the Air Carrier Regulations, the CTC had not been informed that the insurance coverage for the Beaver had been cancelled.

11. Transport Canada amended the company's OC to operate the Beaver and did not verify if the aircraft weight and balance form was included in the company's operations manual.

12. The operator failed to submit on two different occasions the required weight and balance form for the aircraft following the base inspections in 1985 and 1986 by Transport Canada.

13. There was inadequate follow-up by Transport Canada of the discrepancies noted by Air Carrier personnel following the company's base inspections in 1985 and 1986.

14. The time accrued on the Beaver was in excess of that documented in the Technical Log Book.

15. The pilot was certified and qualified for the flight in accordance with regulations.

16. The aircraft was certified and maintained in accordance with regulations and approved procedures.

17. The aircraft was not equipped with the means to communicate with the company's base as stipulated in the company's operation manual.

Causes:

The aircraft was loaded beyond the specified weight and centre of gravity limits. It is probable that the pilot lost control of the aircraft while attempting a precautionary landing.

SAFETY ACTION:

Action Taken:

The CASB issued recommendation CASB 88-01 as a result of the investigation into an accident involving a float-equipped aircraft at Dease Lake, British Columbia on 27 September 1986. This recommendation dealt with the need for air carriers operating float-equipped aircraft to carry out pre-flight passenger safety briefings. The Air Toro accident re-emphasizes the need to ensure that passengers are provided with pre-flight safety instructions, including briefing cards which depict escape routes and which provide information on the operation of such survival equipment as the ELT.

The CASB has completed a study on the utilization of shoulder harnesses on small commercially operated and privately owned aircraft. The report (SP87-002) entitled "Study of the Influence of Shoulder Harnesses in Aviation Safety" contained two recommendations – specifically, the Board recommended that:

The Department of Transport require the installation of shoulder harnesses, where practicable, in the flight crew seats of all small commercial aircraft, regardless of their date of manufacture; and

(CASB 87-58)

The Department of Transport institute a comprehensive program to promote the benefits of using shoulder harnesses and encourage the installation of shoulder harnesses in privately owned aircraft.

(CASB 87-59)

The National Transportation Act, 1987 and the Air Transportation Regulations which came into force on 01 January 1988, now govern what insurance requirements need to be complied with by Canadian air carrier operators. The National Transportation Agency is responsible for ensuring that the new legislation with respect to air carrier liability insurance is complied with. Accordingly, the Agency has undertaken a number of related initiatives: new and additional filing requirements have been imposed; insurance verification by the Agency's Enforcement Directorate has been stepped up; and closer relationships with the insurers of the air carriers have been developed. The Board believes that these measures will indirectly contribute to the overall safety of the Canadian aviation industry.

Action Required:
The circumstances of this occurrence indicate inadequacy in the methods by which Transport Canada (TC) amends Operating Certificates (OCs) and in the follow-up to observations made after a TC audit of a company's operations.

Air Toro was granted an amendment to its OC on 28 June 1984 enabling the operation of Class IV Group B aircraft. The approval was authorized, even though the company's operation manual did not include weight and balance forms for the Beaver aircraft. Transport Canada conducted a base inspection of Air Toro Incorporated in June 1985 and informed the company via letter that sample weight and balance forms for the DHC-2 were to be forwarded to Transport Canada by the end of August 1985. The company did not comply, and Transport Canada did not follow-up on the observation. In August 1986, Transport Canada conducted another base inspection and advised the company, once again in writing, of the necessity to prepare and forward weight and balance forms for the DHC-2 to the Transport Canada regional office for approval. Air Toro replied to Transport Canada in October 1986 but did not include the required weight and balance forms. There was no subsequent follow-up action by Transport Canada to either obtain the weight and balance forms from Air Toro or to suspend Air Toro's OC because of non-compliance. Consequently, Air Toro continued operations as a Class IV carrier despite evidence that commercial operations were being conducted without adequate documents to enable the safe operation of the Beaver aircraft. Therefore, the CASB recommends that:

The Department of Transport improve procedures for the follow-up to any outstanding items from the audit of a company's operations.

CASB 88-31

Pilots engaged in the commercial operation of single-engined aircraft of 12,500 pounds or less are required to possess a valid commercial pilot's licence and to conduct three take-offs and landings in any preceding 90-day period. In seasonal operations such as Air Toro's, pilots of single-engined aircraft often cease flying during the winter months, conduct three take-offs and landings at the beginning of the next season, and commence commercial fare-paying operations without any form of proficiency evaluation. This contrasts with pilots who operate multi-engined aircraft commercially; they are required to complete a pilot proficiency flight check annually. Consequently, 10 or more fare-paying passengers in a large single-engined commercial aircraft may not have the same guarantee of demonstrated pilot competence as two or three passengers in a small multi-engined aircraft. This anomaly in regulatory requirements constitutes a safety deficiency.

Mr. Justice L. Dubin, in the "Report of the Commission of Inquiry on Aviation Safety" (Vol. 3) noted that many accidents involving single-engined aircraft are caused by inappropriate responses to emergencies or abnormal situations; consequently, he sought annual mandatory flight checks for commercial pilots who only fly single-engined aircraft under visual flight rules. However, no such measures have yet been introduced.

The Board recognizes that there would be logistical difficulties in introducing an annual proficiency flight test, including the requirement for more TC inspectors and the possibility of conducting flight examinations in single-engined aircraft not equipped with dual flight controls. Nonetheless, the Board believes that practical and effective methods of flight testing in single-engined commercial aircraft are possible.

American regulatory authorities require a flight review of all licensed pilots every 24 calendar months (FAR 61. 57 refers), and an annual flight competency check of pilots commercially operating single- and multi-engined aircraft (FAR 135. 293 refers).

Given the fact that the accident pilot had never received any form of pilot proficiency check on the Beaver and given the circumstances of this accident wherein TC inspectors had observed on a lack of "serious" company training, the Board believes that at least minimal measures to audit pilot proficiency are required.

In view of the disparity in standards between commercial single-engined and multi-engined operations concerning the verification of pilot proficiency and bearing in mind the difficulties in maintaining pilot proficiency in seasonal operations, as demonstrated during this investigation, the CASB recommends that:

The Department of Transport institute a method of ensuring the proficiency of pilots who are engaged in the commercial operation of single-engined aircraft in VFR operations only.

(CASB 88-32)

Safety Concerns:
The investigation of this occurrence reconfirmed a number of practices by float operators which could have serious safety ramifications and which had been identified in previous investigations; for example, the operation of overweight float-equipped aircraft and the practice of regularly backing up the aircraft onto the shore for loading. The CASB earlier identified the need to undertake a safety study of float-equipped aircraft accidents; consequently, information from this occurrence will be used to assist in the validation of such safety deficiencies.

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AIR NORTH CHARTER AND TRAINING LTD.
CESSNA 206 SUPER SKYWAGON C-GLIZ
DAWSON, YUKON 75 mi S
25 JUNE 1987

REPORT NUMBER: 87-W70043 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1020 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,130	500
LAST 90 DAYS	50	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The aircraft was on a charter flight to transport personnel and equipment to a private airstrip at Claymore Mines, Yukon. The pilot flew over the airstrip to check the runway conditions and noted that he would be landing with a tail wind of about 15 mph. Because of the tail wind and light mechanical turbulence, the pilot flew the approach with full flap selected and at 85 mph, which is 5 to 10 mph higher than normal. Based on his previous experience of flying into this strip, he was aware that he might encounter wind gusts on final approach. Over the approach end of the runway, the aircraft ballooned. The pilot continued the approach, touching down with about 1,000 feet of runway remaining. The brakes were applied, and, just before running off the end of the runway, the pilot attempted to ground loop the aircraft. The aircraft came to rest in a natural water drainage ditch located at the end of the runway.

When the pilot applied full braking after touchdown, the left brake felt spungy, and, by the end of the landing roll, it was ineffective. During the landing roll, the aircraft was pulled to the right. The left brake had been serviced on the previous day because a similar condition had been reported. Because of unfavourable wind conditions, the investigation team was unable to land at the accident site to determine the cause of the left brake malfunction. The landing weight of the aircraft was calculated to be at or near its maximum gross weight.

The Claymore airstrip is located at an elevation of about 3,700 feet above sea level and is about 1,800 feet in length. The approach is made over a valley, and the runway has an upslope of about one and one-half degrees. The terrain on both sides of the runway slopes downwards, and, at the overshoot end of the runway, there is an upslope of about 15 degrees. The runway surface is compacted gravel, and the width increases slightly along the upslope. Because of the rapidly upsloping terrain at one end of the runway, it is considered a one-way-in, one-way-out airstrip.

As well, once past a certain point on approach, a pilot is committed to land.

When the pilot elected to land on the relatively short airstrip, he did not consider all the factors which could affect aircraft performance. With the combination of a tail wind and an approach speed 5 to 10 mph higher than normal, the aircraft's ground speed on touchdown was about 20 mph higher than it would have been under zero-wind conditions. When an updraft caused the aircraft to balloon on final approach, the pilot was already committed to land because of the steeply rising terrain at the end of the runway. The aircraft landed long, and, with only 1,000 feet of runway remaining after touchdown, and because of the poor brakes, the pilot was unable to stop the aircraft before it left the runway. Had the left brake been effective, the pilot still would not have been able to stop the aircraft on the runway. The pilot did not attempt to ground loop the aircraft to the right because of the unsuitable terrain in that direction.

One or more low approaches over the runway in the direction of the intended landing would have enabled the pilot to assess the conditions more accurately before attempting the landing.

FINDINGS:

Cause Related:

1. The aircraft ballooned on final approach and landed long.

2. The aircraft touched down with 1,000 feet of runway remaining, and the pilot was unable to stop the aircraft before it ran off the end of runway.

3. The left brake of the aircraft was not fully serviceable.

Other:

-Nil-

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AVIATION LES ISLES LTÉE
CESSNA 172 M SKYHAWK C-GCOD
RÉSERVOIR GOUIN, QUÉBEC
29 JUNE 1987

BRIEF NUMBER: 87-Q70025 (Accident)
LOCAL TIME: 1430 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,700	600
LAST 90 DAYS	200	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot and two passengers were taking off on a charter flight from Réservoir Gouin to Mascouche, Québec. Shortly after take-off, at an altitude of approximately 25 feet above the ground, the aircraft encountered turbulence, rolled left to a 90-degree bank angle and then back to the right, again to a 90-degree bank angle. While in the right bank, the right wing tip contacted the ground, and the aircraft cartwheeled to a stop beside the runway. All occupants escaped without serious injuries. The wind was blowing 90 degrees to the runway in use at 15 knots. The runway was bordered on both sides by trees.

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KEEWATIN AIR LTD.
BEECHCRAFT TC45J C-GBLI
WHALE COVE, NORTHWEST TERRITORIES
30 JUNE 1987

REPORT NUMBER: 87-C70049 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1215 CDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,860	56
LAST 90 DAYS	240	56

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	3

SUMMARY REPORT:

Following a normal approach and landing, the pilot selected reverse thrust, and, as the aircraft slowed, he applied the brakes. The left brake failed, and the aircraft swung off the runway before corrective action could be initiated.

The aircraft was on its first flight after the left brake had been changed. While taxiing for take-off, the left brake had faded, but the pilot had believed that the brakes were satisfactory and that the brake pucks would seat properly after a short period of use. Prior to landing, the pilot pumped the brakes twice to confirm pressure. When the brakes were inspected after the accident, the right brake was serviceable, but air was found in the left brake system, although it had been bled the night before.

When brakes were applied following touchdown, the left brake did not function properly because of air in the system. The right brake functioned normally, causing the aircraft to swing to the right. The aircraft left the runway before the pilot could take corrective action.

CONCLUSIONS:

Findings:

1. After touchdown, directional control was lost because of an unserviceable left brake.

2. The left brake did not function properly because of air in the system.

Causes:
Directional control was lost because of incomplete bleeding of the brake system.

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NAHANNI AIR SERVICE LTD.
HELIO COURIER H395 C-FSAA
GODLIN LAKE, NORTHWEST TERRITORIES
01 JULY 1987

REPORT NUMBER: 87-W70045 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1740 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	25,000	16,000
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The pilot and three passengers were on a flight from Norman Wells, Northwest Territories to Godlin Lake, Northwest Territories. Near destination, the engine (Lycoming GO-480-GID6) backfired and lost power. Unable to glide to the airstrip, the pilot selected a sandbar on the Godlin River for the forced landing. On landing, the tail section and both landing gear attachment points were damaged. None of the occupants were injured.

The engine was removed from the aircraft and shipped to the Canadian Aviation Safety Board (CASB) in Edmonton for disassembly. On disassembly, it was determined that three camshaft drive gear retainer bolts had come loose and one bolt had failed. The camshaft drive gear locating dowell had sheared. The failed parts were then shipped to the CASB Engineering Laboratory in Ottawa, where the mode of failure of the dowell was determined to be fatigue.

On 27 June 1983, at 440. 3 hours time since overhaul, the engine was repaired because of a cracked crankcase. When the crankcase was replaced so was the camshaft, but the cam drive bolts were not replaced, although their replacement was required according to the Parts Replacement List. The engine was reinstalled in the aircraft which flew another 97.7 hours before this occurrence took place.

Examination of the failed parts indicated that, when the camshaft drive gear bolts lost their torque, abnormal loads were applied to the camshaft and camshaft drive gear locating dowell, resulting in fatigue failure of the dowell. This caused the engine failure which resulted in the pilot making a forced landing.

CONCLUSIONS:

Findings:
1. The engine failed as a result of the loss of torque on the camshaft drive gear bolts.

2. The cam drive bolts were not replaced as required at the time of crankcase replacement.

Causes:
The camshaft drive gear bolts were not replaced as required, and the old bolts were probably not properly torqued.

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ICARUS AVIATION LTD.
CESSNA 421A C-GJTA
CHILKO LAKE AIRSTRIP, BRITISH COLUMBIA
05 JULY 1987

REPORT NUMBER: 87-P70046
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1955 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,000	200
LAST 90 DAYS	120	25

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	5

HISTORY OF THE FLIGHT:

The pilot took off with his five passengers from Tsacha Lake Lodge at 1925 Pacific daylight time (PDT) for a flight to Vancouver, British Columbia, with a planned refuelling stop at Chilko Lake Airstrip. Shortly after touching down at Chilko Lake Airstrip, the aircraft's right main gear collapsed, allowing the right wing tip to drag on the ground. The aircraft veered to the right, off the runway and continued down an embankment. The passengers were unable to open the overwing exit and the main cabin door, and they had to wait until the pilot opened the main cabin door; there were no injuries.

PERTINENT INFORMATION:

The runway at Tsacha Lake was soft and muddy due to recent rains, and mud thrown up by the wheels was still adhering to the landing gear after the accident.

The runway at Chilko Lake is a 3,200-foot-long gravel strip in good condition with the exception of two small sandy areas. Ground marks indicate that it was at one of these areas that the gear collapsed and the wing tip started to drag on the ground.

It was a cool, clear evening with a 15- to 20-knot wind from the south, and the landing was made into wind. When the aircraft was lifted after the accident, one lug of the forkend of the bellcrank, part number 5041001-2, was found missing. The bellcrank was sent to the Canadian Aviation Safety Board Engineering Laboratory where it was concluded that the lug had broken off because of overload.

The procedures to open the emergency exit and the main door are detailed on placards at each position and on the safety information card provided for each passenger. To open the overwing emergency cabin exit, a table must first be removed from the side of the fuselage before turning the handle and pulling the window in. The table attaches to both the emergency exit and the side of the fuselage, effectively tying the two together. There is also a seat armrest attached to the emergency exit and extending behind the seat back which can further hinder the removal of the emergency exit door.

The main door latch is secured in the closed position with a T-shaped pin on the end of a safety chain. The pin is released by pressing a button on the top of it. Although the procedures to open the emergency exit and main door were placarded and therefore available to the passengers, the complicated opening procedure in each case confused the passengers, and they were unable to open either exit.

ANALYSIS:

The right gear collapsed, possibly as a result of the mud on the mating surfaces of the side brace. The mud was thrown into the wheel well during take-off from the muddy strip at Tsacha Lake. This may have prevented the gear from locking fully in the overcentre position. The extra drag on the right wheel when it passed through the soft sandy spot possibly jarred the unlocked side brace, causing it to collapse. As the side brace collapsed, the load on the strut from the weight of the aircraft would have been transferred onto the bellcrank, which then failed in overload.

FINDINGS:

Cause Related:
1. The right main landing gear side brace unlocked due to a combination of extra drag from the wheel passing through soft sand and possible mud contamination of the locking mechanism.

2. When the gear collapsed, part of the weight of the aircraft was transferred to the bellcrank which then failed in overload.

Other:
1. The procedures to open both the overwing emergency exit and the main cabin door were confusing.

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AVIATION LAC ST-AUGUSTIN ENR.
DE HAVILLAND DHC-2 MK1 BEAVER C-FRZL
LAC OMER, QUÉBEC
05 JULY 1987

BRIEF NUMBER: 87-Q70026 (Accident)
LOCAL TIME: 1440 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,700	N/A
LAST 90 DAYS	100	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The charter flight was departing Lac Omer with five persons on board. The lake is bordered by mountainous terrain. During the take-off run, a sudden gust of wind from the left rear caused the aircraft to yaw to the left. The pilot reduced power to discontinue the take-off but was unable to prevent the aircraft from contacting an overhanging branch which damaged the left wing, left flap, and the engine cowling. The aircraft further yawed to the left before running up on shore. No one was injured.

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RISK OF COLLISION BETWEEN:
BOEING 727-233 C-GAAQ and
CESSNA 152 C-GMUH
CALGARY INTERNATIONAL AIRPORT, ALBERTA
08 JULY 1987

REPORT NUMBER: 87-H74001
LOCAL TIME: 1448 MDT
INFORMATION SOURCE: Field Investigation

BOEING 727-233 C-GAAQ

OPERATOR: Air Canada
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	15,000	400	14,000	5,000
LAST 90 DAYS	110	110	130	130

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	8
PASSENGERS	-	-	136

CESSNA 152 C-GMUH

OPERATOR: Calgary Flight Training Centre
OPERATION: Flying Club Training
DAMAGE: None
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	800
LAST 90 DAYS	300	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The Cessna aircraft was on a local training flight with an instructor and a student on board. The aircraft was cleared for take-off on runway 34 with a left turn out to the northwest training area at an altitude at or below 5,500 feet above sea level (asl). The Cessna took off at 1443 mountain daylight time (MDT) and proceeded straight ahead for approximately one mile off the departure end of runway 34 and then commenced a climbing left turn to a heading of 280 degrees magnetic (M). At 1446 MDT, Air Canada 113, a Boeing 727, was cleared for take-off on runway 28 with a Calgary One departure (climb on a heading of 295 degrees) en route to Vancouver. On climb-out, at an altitude between 5,500 and 6,000 feet asl and approximately three miles from the airport, the first officer of the Boeing 727 saw the Cessna at his one thirty to two o'clock position, at the same altitude and at a distance of about 900 feet. No avoidance action was taken, and the Boeing 727 overtook the Cessna on the Cessna's left side with a separation of approximately 300 feet.

PERTINENT INFORMATION:

The reported weather at 1400 MDT for Calgary was sky condition 5,000 feet above ground level (agl) scattered, 10,000 feet agl scattered, estimated ceiling 23,000 feet agl broken, visibility 40 miles, and wind 350 degrees at eight knots. The weather was essentially unchanged at the time of the incident.

The terminal building at Calgary Airport is located in the northeast corner of the airport between the buttons of runways 16 and 28. When runway 34 is in use and if the wind permits, aircraft departing the terminal ramp area prefer to use runway 28 rather than runway 34, because of the considerably shorter taxi distance. In addition, pilots of westbound traffic prefer runway 28 as this is in the direction of their flight.

The Cessna aircraft was proceeding under visual flight rules (VFR) to a flying training area (CYA 206 T) which extends from the surface to 11,000 feet asl and is 15 miles from the Calgary Airport on the extended centre line of runway 28.

There were three transmissions between the tower and the Boeing 727 in which a take-off on runway 28 was requested, given, and acknowledged. Although on tower frequency at this time, neither the instructor nor the student in the Cessna heard these transmissions; radio transmissions between the tower and aircraft in the Calgary Control Zone are usually clear and reliable. Immediately after the incident, the tower controller asked the pilot of the Cessna to report his altitude, and the pilot replied 5,500 feet asl.

There are two air traffic control procedures which are used for VFR departures from runway 34 when runway 28 is also in use. The first procedure requires the departing VFR traffic to turn before reaching, and to remain south of, runway 28. There is 9,000 feet of runway from the threshold of runway 34 to the intersection of runways 34 and 28. The second procedure permits the VFR traffic to cross to the north of runway 28 but then restricts the aircraft to a heading that keeps it clear of the departure corridor of runway 28. In all cases, VFR traffic is restricted to 5,500 feet asl or below while in the Calgary Control Zone.

The noise abatement procedures for jet traffic at Calgary call for the use of the maximum rate of climb to 6,500 feet asl. The Calgary One departure procedure for runway 28 calls for a climb on a heading of 295 degrees to 7,000 feet asl. The Boeing 727 was conforming to both of these procedures.

The crew of the Boeing 727 switched to departure frequency shortly after take-off as instructed; however, they did not communicate with departure control until after the near-miss incident. The Boeing 727 captain stated that the crew's primary concerns during this initial climb were to fly the aircraft accurately and to maintain a good look-out; as a result of this, the call to departure control was delayed until the aircraft was four to six miles from the airport. Also, to improve his look-out capability while the aircraft was in this relatively steep nose-up attitude of approximately 15 degrees, the captain, who was not flying the aircraft, raised his seat to the full-up position.

The tower controller stated that he simply forgot about the Cessna during the three-minute interval between the two take-offs. He had begun his shift at 0700 MDT and had worked without a break, up until the time of the incident, a period of over seven and one-half hours. A full tower shift consists of three controllers, a supervisor, and an assistant; the morning shift is usually increased to four controllers at 0900 MDT.

ANALYSIS:

The CYA 206 (T) training area is only 15 miles from the Calgary Airport on the extended centre line of runway 28, one of the most heavily used departure runways for large aircraft at Calgary; but it appears that local procedures provide adequate safety measures as there have been few problems associated with the location of this area in the past.

The pilot of the Cessna aircraft conducted his climb and transit towards the training area in accordance with the instructions issued by the Calgary Tower Controller. If the Cessna pilot had heard the transmissions between tower and the Boeing 727, he would have realized that an aircraft was departing on runway 28 and would have remained clear of the departure corridor. The Cessna instructor pilot was with a student pilot on her first flight, and he may have been preoccupied with his instructional duties and missed these transmissions; good airmanship dictates that the pilot of a VFR flight such as this one visually check the departure end of runway 28 before crossing its extended centre line, particularly as this runway is frequently used for departures when runway 34 is active.

The Boeing 727 crew was following the required noise-abatement climb procedure which required the aircraft to climb at a nose-up attitude of 15 degrees. At this attitude, it is doubtful that the Cessna would have been visible to the 727 crew once the 727 was airborne. The Boeing 727 crew were obviously aware of the need for a good look-out during the initial climb and took appropriate action to maximize their look-out capability.

When the tower controller cleared the Cessna for take-off, runway 28 was not in use, and therefore no restrictions were imposed to keep the Cessna clear of the departure corridor of runway 28. When the Boeing 727 crew requested take-off on runway 28, the tower controller should have issued a restriction to the Cessna or held the Boeing 727 until the Cessna was clear. Alternatively, a mandatory VFR departure procedure for runway 34 which requires VFR traffic to remain south of runway 28 whenever there is a possibility of a departure from runway 28 would prevent this type of incident.

Although the tower controller admitted that he forgot about the VFR aircraft, there were mitigating circumstances. The tower staffing levels are such that it is normal for the morning shift to go without a break from 0700 to 1200 hours and sometimes longer. In this particular case, the tower controller had gone almost the entire eight-hour shift without a break. Although it is difficult to say whether or not this affected his performance at the time of the incident, it is well documented that prolonged periods of duty without breaks can adversely affect performance.

FINDINGS:

Cause Related:

1. The tower controller cleared the 727 for take-off on runway 28 without ensuring that the Cessna under his control was clear of the departure corridor of runway 28.

Other:

1. At the time of the incident, the tower controller had worked 7 hours and 48 minutes without a break.

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HARBOUR AIR LTD.
DE HAVILLAND DHC-2 BEAVER C-GWPF
WITHERBY POINT, BRITISH COLUMBIA
13 JULY 1987

REPORT NUMBER: 87-P70049
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1304 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,027	294
LAST 90 DAYS	240	96

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

HISTORY OF THE FLIGHT:

The pilot and four passengers took off in the aircraft from the Vancouver Harbour water aerodrome at Vancouver, British Columbia for Witherby Point, British Columbia, on the southeast coast of the Sechelt Peninsula. On arrival, the pilot flew over the landing area and manoeuvred the aircraft to land, north to south, on the water. During the descending left turn to final approach, the aircraft stalled. Before the pilot could effect a recovery, the aircraft struck the water in a nose-down, right-wing-low attitude; the aircraft nosed over and quickly sank to the floats. The occupants escaped from the submerged aircraft with minor injuries.

PERTINENT INFORMATION:

The pilot stated that, at the time of the accident, there were no clouds in the area, no restrictions to visibility, and the wind was from the southwest at 10 knots. The wind may have been variable near Witherby Point because of the shape and height of the land mass.

Thornbrough Channel, adjacent to the landing area, is about one mile wide between Witherby Point and Gambier Island, and it is more than two miles wide north of the point. The length of the channel offers no restrictions to landing aircraft. The landing area is long and wide enough for safe floatplane operations, and the approach is unobstructed.

The pilot was qualified and properly licensed for the flight and had landed in the area a number of times.

The aircraft had no known pre-flight unserviceabilities and was operating normally at the time of the occurrence. The weight and centre of gravity were within limits.

The passengers had flown frequently in Beaver aircraft. They were not given a safety briefing before the flight; however, safety instructions were displayed in the aircraft cabin. Life-jackets were available but were not being worn at the time of the occurrence. The occupants could not remember how they got out of the aircraft after the accident, but they did recall kicking at and pushing on the doors and windows. They were rescued from the water by people in a nearby boat. After the aircraft was salvaged, it was found that the right rear door was jammed shut, and the three other doors were operating normally; the window glass in the doors was broken or the windows were open, and the pilot's windscreen was broken open. It could not be determined if the damage occurred during the crash, during the occupants' attempts to escape, or during the salvage operation.

The emergency locator transmitter (ELT) activated at impact but did not transmit because it was submerged in water.

ANALYSIS:

Although the landing area was large enough for normal manoeuvring, the pilot banked the aircraft steeply during the descending left turn to final approach. During the turn at low altitude, he applied enough elevator control input to cause the aircraft to stall. When the aircraft stalled, there was insufficient altitude to regain control before the aircraft struck the water. The aircraft may have flown through downdrafts flowing off Witherby Point which would have increased the rate of descent.

After the crash, the pilot and passengers had difficulty finding the exits because of the confusion caused by the darkened interior of the submerged and inverted aircraft. Some of the occupants injured themselves by kicking at and pushing on the doors and windows; they all escaped through the exits that could be opened.

FINDINGS:

Cause Related:

1. The aircraft stalled at low altitude while in a steep turn to the left.

2. The pilot was unable to regain control of the aircraft before it struck the water.

3. Some of the occupants were injured while attempting to force open the aircraft's doors and windows.

Other:
-Nil-

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RISK OF COLLISION BETWEEN: BOEING 737 CP FLIGHT 615 C-GOPW and AN UNIDENTIFIED LIGHT TWIN-ENGINED AIRCRAFT

FLIN FLON, MANITOBA 20 mi E
17 JULY 1987

REPORT NUMBER: 87-C74048
LOCAL TIME: 0910 CDT
INFORMATION SOURCE: Office Investigation

BOEING 737 CP FLIGHT 615 C-GOPW

OPERATOR: Canadian Airlines International
OPERATION: Scheduled Domestic
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	12,000	7,200
LAST 90 DAYS	77	77

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	5
PASSENGERS	-	-	50

UNIDENTIFIED LIGHT TWIN-ENGINED AIRCRAFT

— No information available

HISTORY OF THE FLIGHT:

The Boeing 737 was on a scheduled IFR flight from Thompson, Manitoba to Flin Flon, Manitoba. The Boeing was cleared for an approach to Flin Flon and was on descent through an altitude of about 5,000 feet asl when the captain was forced to take evasive action to avoid collision with a light twin-engined aircraft that was flying on a northerly heading between layers of cloud. The Boeing 737 captain estimated that the aircraft missed each other by about 200 feet.

PERTINENT INFORMATION:

The captain of the Boeing 737 reported a solid cloud layer topped at about 4,000 feet asl that extended from about 20 miles south to 15 to 20 miles north and east of Flin Flon. The weather observation taken at Flin Flon at 0900 CDT showed an overcast ceiling at 1,100 feet above ground level (agl).

The only known traffic in the Flin Flon area at the time was a Beech 95 that had departed The Pas (Grace Lake) at 0845 CDT on a VFR flight to Pukatawagan, Manitoba. The required track of the aircraft passed about 20 miles east of Flin Flon and, at that point, was about 65 nautical miles from Grace Lake. The Beech 95 pilot was interviewed, and he stated that he had flown at an altitude of 4,500 feet asl while en route to Pukatawagan. His report on cloud condition was not consistent with that of the Boeing 737 crew or the observer at Flin Flon; although admitting to being above cloud, the Beech 95 pilot maintained that it was a broken layer and that he was in visual contact with the ground at all times. He was not aware of the Boeing 737 traffic because his radio was not tuned to the Flin Flon frequency.

ANALYSIS:

The Boeing 737 was being operated in accordance with instrument flight rules and as cleared by air traffic control. It would appear that the unidentified VFR aircraft was not complying with the visual flight rules.

FINDINGS:

Cause Related:

1. The pilot of the Boeing aircraft was forced to take evasive action to avoid a collison with an unidentified aircraft.

2. The Boeing aircraft was operating in IFR conditions.

3. The pilot of the unidentified aircraft was not operating his aircraft in compliance with visual flight rules.

Other:
-Nil-

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LOYAL AIR LIMITED

PIPER PA-34-200 SENECA C-GSMD
KINGSTON AIRPORT, ONTARIO
21 FEBRUARY 1987

BRIEF NUMBER: 87-O/70011 (Accident)
LOCAL TIME: 1630 EST
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	18,500	1,000
LAST 90 DAYS	160	45

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The aircraft landed on runway 19 with the landing gear up, slid about 600 feet, and ran off the left side of the runway into snow.

The student had completed simulated engine failure procedures under an instrument flying training hood while in the procedure turn and had carried out the pre-landing checks; however, he left the gear up in the event a missed approach was required. Just prior to the aircraft's reaching decision height, another aircraft ahead landed for a touch-and-go and appeared to stop. The student removed his hood, selected full flap, and applied power to both engines to maintain altitude and an airspeed of 120 mph. As the student was about to overshoot at the approach minimums, the other aircraft lifted off, and the instructor decided to continue with a normal landing. The instructor was distracted by the traffic on the runway and did not detect that the gear was still up until the aircraft was in the flare. He then selected the gear down when the aircraft was about five feet above the runway. The gear warning horn sounded as the student reduced power to land during the flare.

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AERO AVIATION CENTRE LTD.
PIPER PA-38-112 TOMAHAWK C-GDSC
VILLENEUVE, ALBERTA
25 FEBRUARY 1987

REPORT NUMBER: 87-W74016 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1550 MST
OPERATION: Specialty Flying Training
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,450	1,000
LAST 90 DAYS	140	90

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was climbing out from a touch-and-go landing when the tower controller advised the pilot that the left main gear had separated and fallen onto the runway. After circling the airport for one and one-half hours, the pilot made a successful landing on the snow-covered infield.

Examination of the aircraft revealed that the forward bolt of the left main gear retention clamp had fractured, and the clamp was bent open. Multiple marks were found on a spacer in the retention assembly, and there was a corresponding mark on the gear leg. The rear bolt of the retention clamp was loose and bent. It was determined that the forward bolt failed from an overload acting on a pre-existing, bending-induced fatigue crack. This aircraft had been modified in accordance with Piper Service Bulletin 673A (AD 83-05-04) which required replacement of the main gear attachment bolts with new improved high tensile strength bolts. The purpose of this modification was to prevent bending, cracking, or loosening of the main gear attachment bolts, which could result in separated gear. Shortly before this occurrence, Piper Service Bulletin 673B was issued which required further modification to the main gear attachment by calling for installation of even higher strength bolts than those specified in Piper Service Bulletin 673A; this non-mandatory service bulletin had not been complied with for this aircraft.

The multiple marks found on the spacer in the retention assembly indicated that several landings had been made since the forward bolt had broken. The gear leg remained in place during this time because most of the forces acting on the gear leg are rearward and the aft bolt was still holding the back of the clamp closed. Progressive bending of the partially secured clamp eventually allowed the gear leg to swing forward with the wheel assembly oriented 90 degrees to the direction of flight. On the touch-and-go landing, the gear leg folded back and broke away as the aircraft climbed away. Laboratory and engineering analysis of the gear retention assembly determined that, prior to Service Bulletin 673B, significant design deficiencies existed that contributed to failure of the gear.

CONCLUSIONS:

Findings:

1. The left main gear forward attachment bolt failed from an overload acting on a bending-induced fatigue crack.

2. The gear leg swung forward out of the clamp and was bent back on landing, separating from the aircraft.

3. The design of the landing gear retention assembly was deficient on aircraft that had not been modified in accordance with Service Bulletin 673B.

4. Service Bulletin 673B that would have corrected the deficiencies had not been complied with for this aircraft.

Causes:
The design of the landing gear retention assembly was deficient.

SAFETY ACTION:

Action Taken:
Subsequent to this occurrence, Transport Canada issued Service Difficulty Advisory 87-05, dated 09 September 1987, which in part, stated "in the interest of aviation safety pending release of amended AD 83-05-04 (by FAA), it is recommended that operators of Piper PA-38-112 aircraft comply with SB 673B."

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INTERLAKE AVIATION CO. LTD.
CESSNA 150 C-GVAH
GIMLI INDUSTRIAL PARK AIRPORT, MANITOBA
26 FEBRUARY 1987

REPORT NUMBER: 87-C70008 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2035 CST
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	111	101
LAST 90 DAYS	27	27

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on her first night solo flight and had completed a number of circuits and landings. The pilot reported that the engine faltered during the final approach; she advanced the throttle; however, the engine did not respond. The approach was continued, and the main wheels struck a snow-drift short of the runway. The nose of the aircraft descended abruptly, and the nose gear collapsed.

No fault could be found with the engine. It performed satisfactorily prior to the flight and operated without difficulty following the accident. The carburettor heat was functioning normally.

When the pilot thought there was an engine problem, she checked that the carburettor heat was on and advanced the throttle approximately one-quarter to one-half inch. The pilot judged that the aircraft could be landed safely on the runway and took no further action. When the pilot advanced the throttle, she did not advance it sufficiently. As a result, the aircraft landed short of the runway.

FINDINGS:

Cause Related:
1. The pilot did not sufficiently advance the throttle for the aircraft to reach the runway safely.

Other:
-Nil-

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FALLS AVIATION LIMITED
(WELLAND AERO CENTER)
CESSNA 150K C-FQED
WELLAND AIRPORT, ONTARIO
23 MARCH 1987

BRIEF NUMBER: 87-O70020 (Accident)
LOCAL TIME: 1100 EDT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	43	43
LAST 90 DAYS	7	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student pilot was practising circuits and landings. He flew an approach with the flaps up; there was a light cross-wind from the right. Prior to touchdown, the aircraft drifted to the left of the runway centre line. The pilot attempted to centre the aircraft on the runway, but, during the attempt, the aircraft touched down with drift. The nose landing gear collapsed, and the aircraft skidded to a stop on its nose section.

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LAURENTIDE AVIATION LTD.
CESSNA 152 C-GGEU
VALLEYFIELD AIRPORT, QUÉBEC
24 MARCH 1987

REPORT NUMBER: 87-Q70005 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1515 EST
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,769	600
LAST 90 DAYS	47	26

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The instructor was demonstrating a take-off on soft terrain to his student. During the take-off run, the pilot favoured the left side to avoid a pool of water one-third the way along the take-off run. The tail section contacted the gravel near lift-off, and the aircraft veered to the left. The aircraft lifted off, and the right wheel struck a snowbank on the left side of the runway. The nosewheel struck the ground, and the aircraft nosed over. The pilot and student were uninjured.

There were several pools of water beside the 2,400-foot narrow gravel, grass-bordered runway, and the shoulders were soft. There was a two-foot-high snowbank about 45 feet from the centre of the runway. The weather conditions were favourable for the flight, and the wind was calm. The aircraft was operating normally, and there were no malfunctions noted.

During the take-off run, the pilot rotated the aircraft such that the tail touched the runway surface; control of the aircraft became difficult, and the nose-up attitude restricted the pilot's forward vision.

According to the Cessna 152 Operating Manual, during the take-off run on soft terrain, the aircraft must be maintained in a slightly nose-up attitude. If there are no obstacles to clear, the aircraft should then be levelled off and accelerated to climbing airspeed.

The nose-up attitude on take-off was higher than that recommended by the manufacturer, and the nose of the aircraft restricted the pilot's forward vision. Directional control of the aircraft was made difficult when the tail contacted the ground.

FINDINGS:

Cause Related:
1. The pilot did not follow the proper technique for take-off on soft terrain, with the result that the nose-high attitude of the aircraft restricted forward vision and directional control.

2. The pilot did not correct the deviation of the aircraft to the left, and the aircraft struck a snowbank on the edge of the runway.

Other:
-Nil-

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SHEARWATER FLYING CLUB
CESSNA 177 CARDINAL C-GDNM
SHEARWATER AIRPORT, NOVA SCOTIA 1 mi SE
25 MARCH 1987

REPORT NUMBER: 87-A70007 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0927 AST
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,648	11
LAST 90 DAYS	320	11

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	1

SUMMARY REPORT:

The aircraft was returning from a local flight on which a pilot was being checked out on type. On a long final approach for a landing, the engine stopped. The check pilot took control, decided he would be unable to make the runway, and carried out a forced landing on a nearby road. During the roll-out after landing, the pilot saw a vehicle approaching, and he took evasive action by steering to the right. The right wheel went off the edge of the pavement, and, when the pilot realized that the right wing was going to strike trees, he attempted to steer the aircraft back onto the hard surface. However, the lip on the edge of the pavement prevented him from doing so. The right wing struck the trees, swinging the aircraft to the right into a snowbank. The occupants exited without difficulty.

The fuel tanks were examined and found to contain unusable fuel only. When doing the pre-flight inspection, the pilot estimated that the total fuel quantity was 17 U. S. gallons, which, at a normal consumption of 7.5 gallons per hour, was sufficient for the planned flight of less than one hour duration plus the required 45-minute reserve.

Inspection of the aircraft after the accident indicated there was no fuel leakage. The engine stopped after one hour of flight. After the accident, fuel was added to the aircraft, and the engine was tested; it ran normally at idle rpm.

During the approach, the aircraft fuel tanks ran dry, and the engine stopped because of fuel exhaustion.

FINDINGS:

Cause Related:
1. The aircraft engine stopped during final approach because of fuel exhaustion.

2. During the forced landing, the right wing struck trees beside the road.

Other:
- Nil -

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CESSNA 172M SKYHAWK C-GQRI
CHILLIWACK, BRITISH COLUMBIA 8 mi SE
01 APRIL 1987

REPORT NUMBER: 87-P70012
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1727 PST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	53	40
LAST 90 DAYS	5	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	1	2	-

HISTORY OF THE FLIGHT:

The pilot departed from the Chilliwack Airport around 1700 Pacific daylight time (PDT) accompanied by a friend in another aircraft, for the purpose of sightseeing and taking photographs of the area. The surface wind was very light, and, during the entire trip, there was no turbulence or subsiding air noted by the pilot. After take-off, the two aircraft proceeded in loose formation to a high mountain about 20 miles east of the airport and circled around there while the passengers took photographs. They then turned to the west at which time the second aircraft returned to the Chilliwack Airport.

As the accident aircraft approached Mount Thurston from the northeast at about 5,500 feet above sea level (asl), the pilot, who was not experienced in mountain flying, applied full carburettor heat and reduced the throttle setting to almost idle, giving an engine rpm of about 800 to 1000. He then turned into a valley at about 80 mph and began a descent. During the turn, the pilot applied full throttle momentarily to warm the engine, and it responded normally. He then continued the descent to about 4,500 feet asl in the centre of the one-mile-wide valley, placing the aircraft just below the level of the ridge that the aircraft was approaching. The pilot considered turning either to the right or to the left to remain clear of the terrain, but the sides of the valley seemed too close for a safe turn; he decided to apply power, make a climbing turn to the right to clear the high terrain and proceed over the Fraser Valley. He applied full power and moved the carburettor heat control to the COLD position; the engine rpm increased from 800 to approximately 1700 and then decreased until the engine stopped. As the pilot attempted to remain clear of the tree-tops, the airspeed reduced to the point where the aircraft stalled, flicked to the left, and struck the ground after completing a half turn.

The ELT was activated upon impact, and the signal was picked up by satellite. Search and Rescue personnel, overflying the area in darkness, located the position of the aircraft on the initial pass but were unable, even with the use of flares, to distinguish the white aircraft from the surrounding snowbanks. The following morning, the aircraft was sighted, and rescue specialists were dropped. Three of the occupants had survived the crash, a fourth was fatally injured.

PERTINENT INFORMATION:

The engine was removed from the wreckage, and three test runs were completed. The first test was conducted with the original carburettor components. In this test, the engine started and idled normally, but, when power was advanced, the engine accelerated to 1700 rpm and then stopped. The carburettor was then removed from the engine and dismantled. The float needle valve tip was found to be composed of a substance similar to rubber, and there was debris of an undetermined composition and origin sticking to it; the surface of the valve was sufficiently sticky to hold the valve closed against the force of gravity. The float was made of a composite material and had lost some of its buoyancy. The float clip loosely positioned the float needle valve within the chamber but did not hold it securely against the float arm.

The engine was then fitted with a serviceable carburettor and tested; the engine performed in accordance with the manufacturer's specifications. The original carburettor was then fitted with Float Kit 666-915 Model MA4 and reinstalled on the engine. The engine was retested, and, again, it performed in accordance with the manufacturer's specifications.

In April 1984, Facet Aerospace, the carburettor manufacturer, issued Service Bulletin A1-84 which required changing the carburettor float from the composite type to a metal type. The float valve clip supplied with the new float kit holds the float needle valve securely against the float arm. The time of compliance required by this bulletin was at the next 100-hour inspection or, immediately, if carburation problems were being experienced. A second Service Bulletin, A1-84A, issued in May 1984, changed the time of compliance from the next 100-hour inspection to the next carburettor or engine overhaul. The requirement for change if any carburation problems were reported remained the same. The Service Bulletin had not been complied with as neither the engine nor the carburettor had reached its overhaul time, and there had been no problems with carburation. A 100-hour inspection had been completed after the issuance of the second bulletin (A1-84A).

The rear bench seat failed on impact. The left forward leg floor attachment of the seat had been replaced with a smaller fitting but had not been properly welded. The fitting and the weld failed, allowing the seat to collapse.

Both rear passenger seat-belts have separate centre floor attachments; these were incorrectly installed, having the rounded portion of the fitting forward and the hinge pin aft. The centre fitting for the right rear-passenger's seat-belt was torn from the floor attachment during the impact.

The faulty repair to the rear seat and the incorrect seat-belt installation were considered to have met design strength requirements. The right-seat passenger was fatally injured, and the left-seat passenger received serious injuries.

ANALYSIS:

The aircraft performed in a normal manner until power was applied following a descent. Prior to the descent, high-power settings with corresponding high fuel flows, coupled with the heavy carburettor float, kept the float needle valve open. After power was reduced for the descent, the carburettor float chamber filled with fuel, which raised the float and closed the float needle valve.

Because of the sticky substance on the needle valve, the valve stuck in the closed position. When the throttle was opened, the engine ran until the fuel in the float chamber was consumed; the engine then stopped because of fuel starvation.

The carburettor and its components were all original parts. The float, composed of a composite material, had over the years lost some buoyancy. The float needle valve clip in the carburettor was designed to prevent the float needle valve from binding as it moved up and down, but not to hold the float valve securely against the float. Play between the float arm and float needle valve allowed the float needle valve to stick in the closed position since it was not forcibly retracted when the float descended with fuel burn. The sticky needle valve also prevented the less buoyant float from causing the engine to flood during normal engine operation. It is interesting to note that, had the original Service Bulletin remained in force, the carburettor would have been modified before the time of the accident.

The passenger sitting in the rear right seat received fatal injuries during the accident. Although the rear seat was improperly repaired and his seat-belt was incorrectly installed, both were determined to have met design strength requirements and to have failed due to the deceleration forces in excess of the design limits. The collapse of the seat probably contributed to the injuries received by the passenger occupying the left rear seat.

If the pilot had been flying the aircraft to one side of the valley, he would have had sufficient clearance to safely complete a descending turn, and the aircraft could possibly have been force-landed on one of the many logging roads in the cleared areas over which the aircraft had flown.

The aircraft's white paint blended with the surrounding snow cover and made it impossible to be seen in the darkness even with the use of flares; this delayed rescue until daylight the following morning. Had the aircraft been painted a bright color, it is possible that it would have been sighted on the initial pass and the rescue completed sooner.

FINDINGS:

Cause Related:

1. The needle valve tip displayed adhesive characteristics that caused the carburettor needle valve to become stuck in the closed position, thus preventing fuel from entering the carburettor.

2. The Service Bulletin requiring carburettor overhaul was not mandatory upon receipt.

3. The pilot was flying in the centre of the valley when the engine lost power, denying him room in which to turn around.

Other:

1. The rear seat-belt floor attachments were incorrectly installed.

2. The aircraft's white paint scheme delayed rescue.

3. The rear seat left front leg was incorrectly repaired.

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INTERLAKE AVIATION CO. LTD.
PIPER PA-34-200 SENECA C-GYKL
WINNIPEG INTERNATIONAL AIRPORT, MANITOBA
01 APRIL 1987

REPORT NUMBER: 87-C70012 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1205 CST
OPERATION: Specialty Flying Training
DAMAGE: Minor
PILOT LICENCE: Commercial
PILOT HOURS:

	PILOT-IN-COMMAND		EXAMINER	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	295	27	7,700	120
LAST 90 DAYS	115	27	40	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The aircraft took off from Winnipeg International Airport at about 1150 central standard time (CST). On board were the pilot, on a check-ride for an initial instrument rating, and a Transport Canada (TC) Civil Aviation Inspector, who was authorized to conduct the required flight test. After take-off, the pilot selected the gear up and almost immediately, a complete electrical failure occurred. The pilot then joined the circuit for landing. During the approach, the pilot received a red light from the tower controller, and he carried out an overshoot. The emergency gear extension handle was pulled, and, during the second approach to land, a red light was again directed at the aircraft. The pilot overshot, and the TC examiner took control of the aircraft, flew past the tower, and observed a flashing green light. Another approach was carried out, and, on receiving a light from the tower and believing the gear to be down, the examiner landed the aircraft. The aircraft landed with the nose gear partially down and the main wheels retracted.

PERTINENT INFORMATION:

Following the electrical failure, the crew noticed that the right alternator circuit-breaker had popped. Appropriate procedures were taken to restore electrical power but without success. The pilot then selected the landing gear down by the normal method and noticed by use of a mirror located on the left engine cowling that the nose gear was extended. There are no mirrors to check the main gear extension visually. The emergency gear extension system was activated, and the crew believed that the gear was down and locked.

When the recovery team arrived to raise the aircraft, the battery master switch was turned on, and the system operated normally. As the aircraft was raised, the main gear extended on its own, and, when the aircraft was clear of the ground, the main gear locked into the down position. The nose gear did not fully extend because it was held up by the gear door actuating rods which had bent when the gear collapsed. When a slight pressure was exerted on the nosewheel, it fell into the down-and-locked position. The aircraft was placed on jacks, and the landing gear hydraulic system was examined. The emergency gear system was activated through several cycles and operated normally. The gear fell freely with the electrical power both on and off and regardless of the landing gear selector position. Further examination did not reveal any reason why the emergency gear system did not operate when selected in flight.

The battery master switch and relay were removed and examined. The relay control terminals were found to be contaminated with epoxy, which had been used to protect the main contactor terminals, and a small amount had contaminated the control terminals. No fault was found with the master switch. The charging system was investigated, and both overvoltage relays tripped at 15.8 volts. The voltage regulators were bench-checked; the right regulator was set at 14.4 volts and the left regulator at 15.1 volts. The normal voltage setting is 14.2 to 14.3 for this system.

Two days prior to this occurrence, another flight crew in the same aircraft had experienced a complete electrical failure, but the failure was temporary and rectified itself. The problem could not be duplicated on the ground, and no faults were found in the electrical system.

ANALYSIS:

The battery master relay control terminals were contaminated with epoxy, causing poor contact. After the engines were started and the alternators switched on, the battery relay opened, and battery power was lost. When the pilot selected the gear up, the hydraulic pump was energized, and a voltage spike occurred, causing the left overvoltage relay to open, thus shutting off the left alternator. The increased electrical load to the right alternator tripped the circuit-breaker, causing a complete electrical failure. Due to the loss of battery power, the pilot was unable to regain electrical power from the alternators. As the landing gear is electrically activated in the normal mode, the gear-down selection had no effect.

The reason for the emergency landing gear system malfunction could not be determined.

FINDINGS:

Cause Related:

1. The control terminals of the battery master relay were contaminated with epoxy causing poor contact and resulting in an electrical failure.

2. The landing gear could not be lowered by the normal method due to the electrical failure.

3. The landing gear emergency extension system failed to operate for undetermined reasons.

Other:

1. The left voltage regulator was set too high.

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JORDAN FLIGHT TRAINING LTD.
BEECH B95A TRAVELAIR C-GPFS
SPRINGBANK AIRPORT, ALBERTA
04 APRIL 1987

REPORT NUMBER: 87-W70016 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1121 MST
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,645	61
LAST 90 DAYS	126	11

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft departed Calgary, Alberta, on a multi-engine training flight to Springbank, Alberta. The student pilot was in the left front seat and at the controls. On the fourth circuit the crew experienced radio and electrical problems. The landing gear was selected down; but, because the crew was unsure of the landing gear's position, they manually cranked the gear down. The crew then made a normal approach; however, the aircraft landed with the gear retracted.

Prior to the Calgary departure, the student arrived at the aircraft before the instructor and, by using the aircraft's "before-start" check-list, carried out all the pre-flight checks, except for turning on the battery and both generator switches. These switches were left off as he had no intention of starting the engines at that time. When the instructor arrived, and they were ready to go, the student turned on the battery switch, but not the generator switches, and started the engines in accordance with the "starting-engines" check-list. During the run up both pilots noted that the ammeters were reading zero, but they did not check the generator switches. The generator switches were not checked again throughout the flight, despite the fact that the crew experienced radio, then electrical problems.

With the generators off the line, the electrical load soon depleted the battery charge, and, as a result, the crew lost radio communications and the use of all electrical equipment, including the landing gear warning lights. Unsure of the landing gear position, they decided to crank the gear down, but turned the handle in the wrong direction which raised the gear.

FINDINGS:

Cause Related:

1. The generator switches were not turned on prior to starting the engine resulting in the battery going dead during the flight. The before-start check-list calls for the switches to be on.

2. After the crew experienced electrical problems they failed to check the charging systems, namely the ammeters and generator switches.

3. The crew were unfamiliar with the emergency landing gear extension and manually cranked the gear up.

Other:

1. The check-list did not adequately cover the generators after the "before-start" check.

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WATERLOO-WELLINGTON FLYING CLUB
CESSNA 152 C-GGBN
ST. CATHARINES AIRPORT, ONTARIO
07 APRIL 1987

REPORT NUMBER: 87-O/70022 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1557 EDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	42	39
LAST 90 DAYS	12	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The student pilot, who was on his first solo cross-country, was on a visual flight rules (VFR) flight originating at Waterloo-Wellington Airport, with en route stops at London, St. Thomas, and St. Catharines. Shortly after touchdown at St. Catharines, the aircraft started to porpoise down the runway, and the nose gear collapsed. The aircraft skidded to a stop on its nose section. The active runway was 01, and the winds were 319 degrees at 13 knots. The approach was flown with a higher than normal power setting, and touchdown was at 70 knots. During the landing roll-out, the pilot felt the nosewheel shimmy, and he eased back on the control column to relieve some of the weight on the nosewheel. The aircraft lifted off the runway, and the pilot pushed the control column forward. The aircraft then started to porpoise, and the nose gear failed.

When the control column was eased back to relieve the weight on the nose gear, the aircraft had sufficient speed to start flying again. Forcing the aircraft back onto the ground resulted in a second bounce, with porpoising continuing until the nose gear failed in overload. The correct recovery technique would have been either to hold the aircraft off the ground until the speed diminished or to apply power and carry out an overshoot.

FINDINGS:

Cause Related:

1. The aircraft touched down at a higher than normal touchdown speed.
2. The correct bounce recovery technique was not carried out, and the aircraft started to porpoise, causing the nose gear to collapse.

Other:

-Nil-

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OSHAWA FLYING CLUB
CESSNA C-152 C-GCTR
OSHAWA AIRPORT, ONTARIO
22 APRIL 1987

REPORT NUMBER: 87-O/70025 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1110 EDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Student Pilot

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	44	44
LAST 90 DAYS	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

During a simulated soft-field take-off, the aircraft drifted slightly right of the runway center line. The pilot applied left rudder, and the aircraft veered to the left as it accelerated and became airborne. After a short uncoordinated flight at an airspeed of 55 to 65 knots, the aircraft descended and struck the ground on an intersecting runway and nosed over.

Prior to the solo take-off, the student pilot had successfully completed three circuits with his instructor, reviewing the soft-field take-off procedure. All of the circuits were flown using the same runway, with a 20-degree cross-wind from the left at 5 to 10 knots. During this review, the instructor was satisfied with the student pilot's performance and authorized him to fly three or four solo circuits to practise the procedure.

As the aircraft accelerated during the take-off roll, the cross-wind from the left caused the aircraft to drift to the right. The student overcorrected with left rudder, causing the aircraft to veer left as it accelerated. The aircraft then became airborne and started to climb in uncoordinated flight; because of the cross-controlled flight condition, the airspeed was too low to maintain flight, and the aircraft lost altitude and struck the ground.

FINDINGS:

Cause Related:

1. The student pilot used an incorrect cross-wind technique and lost directional control of the aircraft during the take-off roll.

2. The aircraft descended and struck the ground because coordinated flight was not established after take-off.

Other:

-Nil-

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AVIBEC INC.
CESSNA 152 C-GZSP
BROMONT AIRPORT, QUÉBEC
02 MAY 1987

REPORT NUMBER: 87-Q70009 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1415 EDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	44	44
LAST 90 DAYS	13	13

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The student pilot was completing his third solo touch-and-go landing of the day. During the approach, the student encountered moderate turbulence. On the final leg, there was a 5-to 10-knot cross-wind from the right, 10 to 40 degrees off the runway. The approach was made at 60 knots reduced power, with full flaps selected. When the wheels touched down, the intensity of the wind increased suddenly, and the aircraft became airborne. The student tried to land a little further on, without increasing power, but the aircraft landed on its nosewheel and bounced twice. On the third contact with the ground, the front wheel bracket bent, and the propeller struck the ground. The aircraft then turned to the right, the left wing tip touched the runway, and the aircraft slid to a stop.

When the aircraft became airborne because of the sudden increase in the relative wind, the student pilot did not realize that the resulting sudden increase in lift was only temporary. Since the student did not increase the power, the aircraft's performance rapidly deteriorated when the gust died down. The aircraft, which was then about to stall, dived to the ground. After the first bounce, the power had not been increased to diminish the rate of descent, and the same scenario was repeated. Finally, the front wheel bracket bent under the force of the impact.

FINDINGS:

Cause Related:

1. The aircraft became airborne after landing because of a gust of wind, and the student pilot tried another landing without increasing power.

2. The aircraft bounced after the second attempted landing, and the student pilot did not increase power to diminish the rate of descent; consequently, the front wheel bracket bent under the force of the impact.

Other:

- Nil -

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CESSNA 172N C-GVWT
ROCKCLIFFE AIRPORT, ONTARIO
09 MAY 1987

REPORT NUMBER: 87-O/70033 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1800 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	127	40
LAST 90 DAYS	20	16

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The aircraft took off from Muskoka Airport on a flight to Rockcliffe Airport, Ontario, with the pilot and three passengers on board. En route, the pilot received weather information from Ottawa International Airport, which is 10 miles southeast of Rockcliffe Airport. The wind was reported to be from 220 degrees magnetic at 25 mph. Upon reaching Rockcliffe, the pilot attempted communication with the airport in order to obtain wind information, but he received no reply. He then decided to fly a long final approach to runway 27 to determine if the aircraft could be landed with the existing wind conditions. Once satisfied, he continued with the landing. The aircraft touched down, immediately veered to the right, and went off the runway; it then struck and hopped over a concrete platform. The nose gear collapsed rearward, and the aircraft travelled for a short distance through the infield before it nosed over. A small fire ignited in the engine compartment before the occupants exited the aircraft but was quickly extinguished by some nearby people using hand-held fire extinguishers.

The concrete platform, 8 inches high and 11 feet square, which had previously supported a microwave landing system antenna was not considered a hazard as it was 55 feet from the runway edge.

Runway 27, which is asphalt surfaced, is 3,800 feet long and 100 feet wide and has a wind sock at the midpoint.

The Aeronautical Information Publication issued by Transport Canada provides a cross-wind component graph to help pilots determine safe limits for cross-wind landings in light aircraft. Using the graph, for a Cessna 172 landing with a cross-wind 50 degrees off the runway heading, the maximum wind velocity is 18 mph; the wind reported at Ottawa International Airport exceeded this velocity limit by seven mph. When the aircraft touched down in these wind conditions, the pilot was unable to maintain directional control.

When the aircraft's nose gear collapsed after striking the concrete platform, the gascolator bowl, which is located on the firewall near the nose gear support structure, was ruptured. After the aircraft nosed over, the gasoline poured from the bowl onto the hot engine and was immediately ignited. The fire was small as it was fed only by the fuel in the gascolator bowl.

FINDINGS:

Cause Related:

1. Directional control was lost while landing in cross-wind conditions that exceeded the recommended limitations for the aircraft.

2. The aircraft veered off the runway and struck a concrete platform, causing the nose gear to collapse.

Other:

-Nil-

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SUNSHINE COAST AIR SERVICES LTD.
CESSNA 152 C-GZKK
POWELL RIVER, BRITISH COLUMBIA
01 JUNE 1987

REPORT NUMBER: 87-P70032
LOCAL TIME: 1700 PDT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Student Permit

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	31	31
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student pilot was practising touch-and-go landings. As he had encountered turbulence on the last two landings, he decided to make a full-stop landing. The approach and landing flare were normal, but, on touchdown, the aircraft unexpectedly bounced back into the air. The student pilot applied power, but before he could recover, the aircraft landed heavily on the nosewheel, and it collapsed.

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NADIEN MONEA, L. J. LAURIN AND NAUTILUS EXPLORATION LTD.
CESSNA 172G C-GXRJ
KILDEER, SASKATCHEWAN 4 mi W
13 JUNE 1987

BRIEF NUMBER: 87-C70035 (Accident)
LOCAL TIME: 1230 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	52	52
LAST 90 DAYS	24	24

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot was landing on a farm strip in a 90-degree cross-wind at speeds of 10 to 15 knots. During the flare, the aircraft drifted to the right, and one main wheel caught the summer fallow surface beside the runway. As the aircraft came to a stop in the fallow field, the wind caused the tail to rise, and the aircraft nosed over.

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AIR B. C. LTD.
DE HAVILLAND DHC-7-102 C-GFEL
ABBOTSFORD AIRPORT, BRITISH COLUMBIA
16 JUNE 1987

REPORT NUMBER: 87-P74060 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0058 PDT
OPERATION: Commercial Non-Revenue
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	13,000	500	7,500	80
LAST 90 DAYS	225	225	160	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	-

SUMMARY REPORT:

The flight crew – a training captain, a captain candidate, and a first officer trainee – met at the company facility at 1900 Pacific daylight time (PDT) to brief for the proposed training flight. The crew then proceeded to the main terminal to wait for the arrival of the designated aircraft from a scheduled flight. The aircraft, with the training captain in the left-hand seat and the first officer trainee in the right-hand seat, departed Vancouver at 2145 PDT. Following 1. 8 hours of training in the vicinity of the Abbotsford Airport, a full-stop landing was made on runway 19 at Abbotsford at 2330 PDT, to allow the crew to change seats. With the captain candidate in the left seat, the training captain in the right-hand seat, and the first officer trainee occupying the jump seat, the aircraft departed at 2355 PDT to continue the training session. More exercises were carried out, followed by two simulated instrument landing system (ILS) approaches to runway 07 at Abbotsford to minimum altitude, then an non-directional beacon (NDB) approach to runway 07 with a left-hand circling approach to runway 25, with simulated failures of two engines. The aircraft landed at 0058 PDT on runway 25, which was closed for repairs, rolled through an excavated section of the runway, and sustained damage to its landing gear; there were no injuries.

The incident happened at night; the weather was reported as visibility 20 miles, broken cloud at 5,000 feet above ground level, and wind from 240 degrees magnetic at six knots.

Runway 07/25 had been under construction since 11 May 1987 with a displaced threshold; effective 01 June 1987, a Notice to Airmen (NOTAM) was issued stating that the runway was closed. During this period, a NOTAM was in effect stating that the ILS to runway 07 was unserviceable, but also stating that it could be used for flight training purposes during visual flight rules (VFR) weather conditions. This information was available in the NOTAM summary in the company dispatch office and was also contained in the Automatic Terminal Information Service (ATIS) message for Abbotsford, which was being broadcast at the time of the occurrence.

The operating hours of the Abbotsford Control Tower were between 0700 and 2300 PDT, and, as the flight was operating outside these hours, the crew was in communication with the flight service station (FSS). The runway lights for runways 07/25 and the approach lights for runway 07 had been on for some time, and the approach lights for runway 25 were turned on by the flight service station specialist at the request of the training captain, during the last approach. The flight service specialist advised the captain at that time that he would be absent from the FSS for five minutes to take the weather observations; on his return, while preparing the weather report, he was advised by the captain that the aircraft had landed on runway 25 and then asked for taxi directions to the ramp, around the barriers at the end of the runway.

The company flight crew training program is normally carried out after 2200 PDT when the company aircraft are available after daily scheduled operations.

The aircraft was certified and equipped for the flight. Its weight and balance were within the prescribed limits, and no pre-occurrence failures or malfunctions had been reported. On final approach for the landing on runway 25, the aircraft was configured to simulate a two-engine-out condition. The torque of the numbers three and four engines was set for zero thrust, the wing flaps remained retracted, and the wing flap hydraulic system was deactivated; the hydraulic system for the landing gear was also deactivated to permit a practice alternate system landing gear extension. With the aircraft in this configuration, it is normal procedure for the aircraft to land following the approach.

The training captain was licensed and qualified for the flight. To attend to his various duties, he had reported for duty at 1100 PDT, and, at the time of the occurrence, he had been on duty for 14 hours. During the pre-flight briefing, he had not examined the NOTAM summaries which were posted in the company dispatch office, nor did he query the other crew members as to any NOTAMs pertaining to this flight. He had used the Abbotsford Airport and its approach facilities for training purposes several times while the runway was under construction. During the incident flight, he had listened to the Abbotsford ATIS message to obtain the weather and runway information but had switched it off before hearing the rest of the message, which advised of the runway closure.

The captain candidate, who was in the left seat at the time of the incident, was licensed and qualified for the flight. Within the two-week period preceding the occurrence, he had been in the Abbotsford area on a training flight, and, at that time, restrictions on runway 07/25 and its associated ILS approach facility at Abbotsford were in force. He had attended the pre-flight briefing for this flight and remembered looking at the NOTAM for Abbotsford. He remembered the section pertaining to the unservicability of the ILS system but did not remember any reference to the closure of runway 07/25.

The first officer trainee, who was occupying the jump seat, was licensed and qualified for the flight. He had attended the pre-flight briefing and looked at the NOTAMs, and he remembered that the ILS system for runway 07 at Abbotsford was unserviceable but that it could be used for training purposes. He did not, however, remember seeing any reference to the closure of runway 07/25. He also had used the Abbotsford Airport and its approach facilities for flight-training purposes, within the preceding week.

In the 60 days preceding the occurrence, the training captain had been subjected to a busy flight-training schedule, he had conducted ground school and pre-flight briefings and had carried out administrative and line flying duties. All of these days had entailed long working hours, and he had only taken single days off at irregular intervals during that period. He had logged 122 hours of flying time in the preceding 60 days, 76 hours of that in the preceding 30 days. During one five-day period alone, a week before the occurrence, he had travelled to Toronto, spent 30. 6 hours in the air conducting training: 7. 7 hours in each of two days and 6. 1 hours in another. He then travelled back to Vancouver on the sixth day, arriving at midnight. He took the following day off, but he was back on the job on the next day for a 10-hour day. The next three days were spent alternating between flight-crew training and administrative duties. The fourteenth of June was a day off and on the fifteenth, the day on which the occurrence flight commenced, the training captain had reported for duty around 1100 PDT.

Fatigue, as defined in the United States Air Force (USAF) Flight Surgeons' Manual, is categorized as acute, chronic, or cumulative. While acute fatigue is caused by sleep loss and mental exertion over long time periods, cumulative fatigue is caused by insufficient recovery from several periods of acute fatigue. Chronic fatigue is caused by disease and, as such, must be diagnosed and treated clinically. Fatigue is insidious in nature, and its effects are "a general decrease in pilot performance with an increase in time, workload, or both; reduced ability to concentrate; reduced vigilance; lower standards, resulting in a willingness to accept wider margins of error; and reduced ability to perform complex tasks. "

All three crew members had used the Abbotsford Airport and facilities in the days preceding the occurrence and were aware of the construction on runway 07/25 and the restriction on the use of the ILS signal for runway 07. As the NOTAM for Abbotsford was not discussed during the pre-flight briefing, the crew commenced the flight without knowledge of the current status of the facilities at Abbotsford Airport. Because the training captain did not listen to the complete ATIS message which contained the text of the relevant NOTAM, he also missed an opportunity to obtain the latest information on the runway status. The training captain, expecting that runway 25 was available, instructed the pilot at the controls to fly a circling approach to runway 25, and he configured the aircraft in such a way that a full-stop landing was expected. Because it was nighttime, the excavation on the runway was not noticed during the approach and landing.

The training captain had been subjected to a strenuous working schedule for the past two months with only single days off at irregular intervals; this time-off was insufficient to recover from fatigue caused by the periods of intense activity. During the past two weeks, he had been particularly busy and had worked long hours in each duty day. It is probable the captain was suffering from fatigue which would have contributed to the oversight.

CONCLUSIONS:

Findings:

1. Runway 07/25 at Abbotsford was under construction and NOTAMed closed.

2. The NOTAM for Abbotsford was not reviewed during the pre-flight briefing, and the crew did not listen to the

portion of the ATIS message containing the runway closure information, while flying into Abbotsford.

3. The training captain had been on duty for 14 hours prior to the incident.

4. The training captain was probably suffering from fatigue caused by a heavy workload in the past 60 days.

5. The incident occurred at night.

Causes:
The crew did not determine the status of the runway before landing.

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AIR B. C. LTD.
DE HAVILLAND DHC-6-100 TWIN OTTER
C-FAKM
GAMBIER ISLAND, BRITISH COLUMBIA
22 JUNE 1987

REPORT NUMBER: 87-P70038 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0920 PDT
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	26,000	6,000
LAST 90 DAYS	120	120

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The float-equipped aircraft had departed from the Vancouver Harbour, British Columbia, for a training flight in the Howe Sound area, about 20 miles to the northwest of Vancouver. On board were the company training captain and a captain trainee, who was at the controls. Following the successful completion of three take-offs and landings, the captain trainee commenced another take-off. During this take-off run, the left float came out of the water first; the aircraft veered sharply to the right and became airborne in a nose-up, right-wing-low attitude. The training captain, in an effort to control the aircraft, reduced the power to idle, and the aircraft came down hard on the left side. The tip of the left float dug into the water, the left wing tip then contacted the water, and the aircraft bounced from side to side before coming to a halt. The aircraft was then taxied to a private dock on Gambier Island and secured. There were no injuries.

The training captain was a very experienced DHC-6 pilot and instructor, and he was familiar with the area of operation. Several days before the occurrence, in his capacity as training captain for the company, he had flown with the captain trainee and had given him a co-pilot check-out on the float-equipped DHC-6. The captain trainee had limited experience with this type of aircraft, in particular when equipped with floats. He had not flown this type for about five years, and, in the 90 days preceding the occurrence, he had accumulated three hours of float-flying on type, of which one and one-half hours were dual.

The sky was clear, the wind was less than five knots, and the water surface was lightly rippled. The aircraft was airworthy, and no unserviceabilities had been reported. A Twin Otter on floats is nose heavy, particularly in a training configuration, and requires additional nose-up trim and considerble back pressure on the yoke during take-off. It is not equipped with water rudders, and directional control on take-off is maintained with the rudder and differential power from the engines.

With his right hand on the overhead throttles and only his left hand on the control wheel, the pilot may have inadvertently applied right aileron when he pulled back on the yoke. The aircraft would then have lifted off on the left side first, and, without immediate and opposite control input to the ailerons and the application of left rudder and differential power from the engines to maintain directional control, the aircraft would have veered to the right. When the training captain recognized the precarious flight condition and closed the throttles, he was not able to prevent the aircraft from striking the water heavily on the left side.

FINDINGS:

Cause Related:
1. The captain trainee lost control of the aircraft during the take-off roll.

2. The training captain was unable to immediately re-establish control of the aircraft.

3. When the training captain assumed control and closed the throttles, the aircraft fell heavily to the water, damaging the left float and wing.

Other:
- Nil -

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INTERLAKE AVIATION COMPANY LTD.
PIPER PA-34-200 SENECA C-GYKL
GIMLI, MANITOBA
28 JUNE 1987

REPORT NUMBER: 87-C70094 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1000 CDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,250	220
LAST 90 DAYS	90	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The instructor and commercially licensed student were on a initial multi-engine training flight. After 50 minutes of air work, they did a normal touch-and-go landing and completed another circuit. On final approach, the three landing gear lights indicated that all three wheels were down and locked. When the aircraft touched down, the nose gear collapsed.

The nose gear actuator on this aircraft is attached to the bulkhead by a link assembly and a mounting bracket. A downlock link connects the link assembly to the lower drag brace. The downlock link, on gear extension, keeps the drag brace in a fully extended position.

Examination revealed that the mounting bracket was distorted and cracked; the link assembly attachment holes in the mounting bracket were elongated; and the link assembly was bent. In addition, the rod end on the downlock link was bent, and the downlock link was distorted.

The landing gear had collapsed on this aircraft 65.4 hours flying time prior to this occurrence (CASB Report 87-C70012). After a complete electrical failure, the aircraft was landed with the main gear up and the nose gear down, but not locked. The landing gear system was inspected after the occurrence, and a landing gear retraction test was conducted. The landing gear appeared to function normally, and the aircraft was returned to service. During the previous occurrence, the linkages were driven rather than drawn, thus applying compressional loading to the downlock link, the link assembly, and the mounting bracket. Loading would have been of sufficient strength to cause damage to any one or all of these components. Rigging of the downlock link is critical to the correct operation of the landing gear. Landing loads on the nose landing gear during the following 65 hours of flying resulted in further damage, putting the rigging out and resulting in a second collapse of the nose landing gear.

CONCLUSIONS:

Findings:

1. Damage to the downlock link, to the link assembly, or to the mounting bracket went unnoticed after a previous nose gear collapse.

2. The geometry of the nose landing gear deteriorated as further damage was incurred during the next 65 hours of operation.

3. The nose gear collapsed when the drag brace was no longer held in a fully extended condition.

Causes:
Damage from a previous accident had not been detected.

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67238 MANITOBA LTD.
CHAMPION 7ECA CITABRIA C-GYKG
VIRDEN, MANITOBA
08 JULY 1987

BRIEF NUMBER: 87-C70050 (Accident)
LOCAL TIME: 1930 CDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	450	97
LAST 90 DAYS	120	97

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The dual student landed the aircraft and was turning to back-track on the runway when the pilots heard a sound, described as a slight"pop. " The instructor thought that the engine had backfired and stopped to check the magnetos at an intermediate power setting. The engine ran satisfactorily, but, still concerned, the instructor decided to carry out another check, at full power, while taxiing. At a speed of about 25 miles per hour, the aircraft swung to the right; the pilot reduced power to idle and applied brakes, but any application of right brake accentuated the loss of directional control. The use of maximum left brake kept the aircraft on the runway centre line but was not sufficient to prevent the aircraft from running off the end. The pilot intentionally ground looped the aircraft, but, as the aircraft turned, the tail wheel caught in soft earth off the end of the runway which resulted in a twist in the aft fuselage. The right tire was flat and was thought to have caused the "pop" sound.

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MONCTON FLYING CLUB
PIPER PA-28-181 ARCHER C-GQJV
HALIFAX INTERNATIONAL AIRPORT, NOVA SCOTIA
08 JULY 1987

BRIEF NUMBER: 87-A70020 (Accident)
LOCAL TIME: 2230 ADT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	168	13
LAST 90 DAYS	70	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The aircraft landed on runway 24 from a night cross-country flight and was cleared to hold beyond taxiway Charlie, a high-speed turn-off for runway 24 which does not run at 90 degrees to the runway. After being cleared to exit the runway, the pilot made a 90-degree turn into taxiway Charlie and taxied straight ahead between two taxiway edge markers into a ditch. The pilot felt that the outline of the taxiway was not adequately marked with edge lighting. The aircraft landing light was not serviceable at the time of the accident.

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INTERLAKE AVIATION CO. LTD.
CESSNA 150L CF-GHZ
GIMLI, MANITOBA
13 JULY 1987

BRIEF NUMBER: 87-C70054 (Accident)
LOCAL TIME: 0850 CDT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	416	200
LAST 90 DAYS	155	120

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

While demonstrating the recovery action following engine failure after take-off, the instructor wished to emphasize the need to change the pitch attitude quickly and adequately. However, the nose-down attitude demonstrated was excessive for the aircraft altitude, and the pilot was unable to prevent a hard landing. The aircraft was substantially damaged but neither occupant was injured.

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CESSNA 172N SKYHAWK C-GSFI
SALMO, BRITISH COLUMBIA 12 mi SE
17 JULY 1987

REPORT NUMBER: 87-P70052
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1615 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	145	29
LAST 90 DAYS	48	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	2	2	-

HISTORY OF THE FLIGHT:

In the morning on the day of the accident, the pilot called Castlegar Flight Services Station (FSS) and inquired about the weather over his intended flight route to Medicine Hat, Alberta. He was informed that the weather was marginal and getting worse over Alberta; upper level weather conditions were not mentioned.

At 1530 Pacific daylight time (PDT), the pilot called Castlegar FSS again, checked the weather, and, although there was no improvement, filed a visual flight rules (VFR) flight plan to Medicine Hat, Alberta. The planned route was from Nelson to Cranbrook via the Stagleap Pass (elevation 5,700 feet) on the Salmo-Creston Highway, then direct to Lethbridge and Medicine Hat, Alberta. The pilot arranged that, if no radio contact could be established after take off, the Castlegar FSS would open his flight plan at 1545 PDT.

The aircraft departed Trail, British Columbia at approximately 1545 PDT and was unable to contact Castlegar FSS because of the mountainous terrain. Shortly after take-off, the flight encountered turbulence which continued until just prior to the accident. The aircraft climbed until it cleared ridges at the lower level, then proceeded in relatively level flight until a climb was reinitiated upon entering the valley leading to Stagleap Pass. The passengers reported that the aircraft began to fall in a smooth descent about one minute before the crash; the aircraft then struck a 90-foot-high tree and crashed into a highway embankment one-half mile short of and 150 feet below the crest of the pass.

The two adult passengers in the front seats and one of the three young passengers in the rear seat were fatally injured; the two other passengers in the rear seat survived with serious injuries.

At approximately 1600 PDT, a logger working two miles from the crash site noticed the aircraft flying towards the pass and close to the tree-tops on the southern side of the valley. When returning home at 1930 PDT, he saw the wreckage of the aircraft at the bottom of the road embankment near the top of the pass, and he notified the RCMP.

PERTINENT INFORMATION:

The aircraft's weight and balance and the equipment list in the journey log were not up to date. Weight and balance calculations using the current equipment list revealed that both the weight and balance were within the allowable limits. At the time of this occurrence, the aircraft was serviceable, and the engine was producing full power.

The pilot had been trained in mountain flying and was current on the aircraft type. Included in his training were discussions concerning the effect of wind on mountain flying.

A low pressure area centred over the northwestern United States produced a northeasterly flow over southern British Columbia. The upper wind reports from Vernon, British Columbia and Spokane, Washington both confirmed a region of strong winds in the lower several thousand feet. The 6,000-foot winds were forecast to be from 070 degrees at 24 knots in the area of the accident. The reports also indicated areas of strong wind shear and moderate to severe turbulence.

The logger, who saw the aircraft fly by on the southern side of the valley, reported that the wind was blowing down the valley and gusting to 50 mph. The crest of the pass is at the 5,700-foot elevation, with 6,000-foot mountains on each side. The valley extends northeasterly from the crest.

The two survivors reported that the aircraft was being bounced around during flight; they also reported that, prior to striking the tree, the aircraft felt like it was falling and that, when they looked out the cockpit windscreen, the aircraft appeared to be falling. They observed that the pilot was unable to get the aircraft to climb when he applied nose-up elevator. All the occupants were wearing seat-belts. The pilot and the passenger in the right front seat were not wearing the installed shoulder harnesses.

Following the accident, the emergency locator transmitter (ELT), a Dorne Margolin, signal was not picked up by overflying aircraft. The ELT was forwarded to the Canadian Aviation Safety Board Engineering Laboratory where it was tested; the ELT "G" switch and battery were both found to be serviceable, but the ELT signal output power was very low.

ANALYSIS:

The northeasterly winds flowing down the valley towards Stagleap Pass were accelerated by venturi effect as they passed between the 6,000-foot mountains and over the crest of the pass. Once over the crest, the subsiding flow created severe localized downdrafts which exceeded the aircraft's climb performance. It was concluded that ground contact was unavoidable once the aircraft entered the downdrafts at low altitude in an area of rising terrain. It could not be determined why the pilot did not turn around before it was too late.

FINDINGS:

Cause Related:

1. The aircraft was flown into downdraft conditions on the lee side of a mountain pass.

2. For undetermined reasons, the pilot continued the flight until ground contact was unavoidable.

Other:
1. The aircraft weight and balance and equipment list were not current.

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GREENWOOD FLYING CLUB
PIPER PA-28-140 C-FWEL
GREENWOOD, NOVA SCOTIA
21 JULY 1987

BRIEF NUMBER: 87-A70024 (Accident)
LOCAL TIME: 1227 ADT
OPERATION: Specialty Flying Training (Air Cadets)
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	20	20
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student was practising circuits and landings on runway 16 in light and variable wind conditions. On the second landing, the aircraft touched down in a level attitude and bounced. The aircraft then landed in a nose-low attitude; the propeller struck the runway, and the nose tire burst. The nose oleo partially collapsed, and the aircraft skidded 400 feet, coming to a stop on the runway.

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AIR ONTARIO LIMITED
CONVAIR 580 C-GGWG
TORONTO/LESTER B. PEARSON INTERNATIONAL AIRPORT, ONTARIO
20 FEBRUARY 1987

REPORT NUMBER: 87-O/74043 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0912 EST
OPERATION: Scheduled Domestic
DAMAGE: Minor
PILOT LICENCE: Airline

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	9,500	6,000	7,200	1,000
LAST 90 DAYS	200	200	150	150

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	4
PASSENGERS	-	-	48

HISTORY OF THE FLIGHT:

As the aircraft approached Gate 74, a lift truck pulling a tow bar overtook the aircraft on the left side. As the truck passed the aircraft, the tow bar broke loose and travelled at an angle of 45 degrees into the arc of the left engine propeller. One of the four propeller blades struck the tow bar and was thrown off, coming to a rest on the apron, about 66 feet from the aircraft. When the flight crew heard the loud bang and felt the subsequent abnormal vibration, both engines were shut down, and an emergency passenger evacuation was safely carried out.

PERTINENT INFORMATION:

At the time of the occurrence, the apron surface was dry, the visibility was 20 miles, and there was no precipitation.

Aircraft approaching Gate 74 at Terminal Two must taxi onto the ramp apron between Terminal One and Terminal Two. Ground support vehicles are commonly in transit throughout this area without control. The apron speed is limited to 25 kilometres per hour.

A lift truck was required to pick up an A300 tow bar at Gate 31, Terminal One for delivery at Gate 61. The mechanic at the gate who hooked up the tow bar for the driver remembered that it had been a busy period; he could not recall if he checked whether the attachment was secure or if the hitch safety pin was inserted. When the driver arrived at Gate 61, the rear tow bar was discovered not attached. A passenger sitting in the rear left seat of the aircraft observed the truck passing at a quick speed prior to the tow bar breaking free. The left engine was being spooled down to about 400 propeller rpm just prior to the tow bar strike. The propeller blade failed in bending overload and separated cleanly at the hub socket.

The tow bar lug used was too large for the lift truck's hitch and prevented the hitch from closing and the safety pin from being inserted.

ANALYSIS:

The tow bar was not attached properly as the truck traversed the ramp apron; as a result, the tow bar separated from the lift truck, continued under its own momentum, and struck the aircraft propeller.

FINDINGS:

Cause Related:
1. The tow bar was not attached properly because the tow bar lug was too large for the lift truck's hitch.

2. The tow bar disconnected while in transit and struck the propeller blade.

Other:
-Nil-

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BUTLER AIR SERVICES
CESSNA 172 C-FBFY
TRENTON, NOVA SCOTIA
22 FEBRUARY 1987

BRIEF NUMBER: 87-A70005 (Accident)
LOCAL TIME: 0915 AST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	300	300
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot, with three passengers on board, had completed a 30-minute local flight. The wind was blowing from the left across the only available runway and was variable at 10 gusting to 15 miles per hour. The approach was slightly high and fast, and, in lieu of overshooting, the pilot landed just past the half-way point of the 3,100-foot bare runway. The wind shifted to the rear of the aircraft, making stopping difficult; the aircraft overran the runway and came to a stop in a snowbank at the end of the runway.

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GANDER AVIATION LIMITED
DE HAVILLAND DHC-3 OTTER C-GLFK
KELLY'S POND, NEWFOUNDLAND
03 MARCH 1987

REPORT NUMBER: 87-A74028 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1500 NST
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,500	1,500
LAST 90 DAYS	50	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The aircraft departed Gander, Newfoundland on a charter flight to Fogo Island, Newfoundland. The aircraft was in cruise flight 20 miles north of Gander when the engine (Pratt & Whitney 1340) started to run rough and lose power. The pilot adjusted the mixture setting and increased carburettor heat, but the engine continued to run rough and smoke started to enter the cockpit. Because the engine was not producing sufficient power to maintain altitude, the pilot decreased power to reduce the amount of smoke entering the cockpit, and he set up the aircraft for a glide with the flaps up, toward a lake. As the aircraft cleared trees which surrounded the lake, the pilot saw an area of bog and shrub trees approximately 400 feet wide, between the trees and the lake. The smoke in the cockpit was increasing, so the pilot cut the mixture control and landed in the bog. The aircraft travelled 100 feet through the bog and sustained minor damage.

PERTINENT INFORMATION:

The exhaust valve on the number one cylinder had broken and been ingested into the cylinder and had subsequently punched a large hole in the cylinder head. Because of the extensive damage to the valve, the mode of failure could not be determined; however, based on studies of other valve failures, the most probable cause was fatigue failure initiating from errosion pitting.

ANALYSIS:

When the smoke in the cockpit began to increase, the pilot became concerned that he might be overcome by smoke, and he elected to land in the bog rather than try to make the lake.

FINDINGS:

Cause Related:
1. A broken exhaust valve, which subsequently punctured the cylinder head, caused the engine to run rough and lose power.

2. The pilot landed the aircraft short of the lake when he became concerned about being overcome by the smoke in the cockpit.

Other:
-Nil-

* * * * *

VICTORIA FLYING CLUB INC.
CHAMPION 7ECA CITABRIA C-GYDX
VICTORIA INTERNATIONAL AIRPORT,
BRITISH COLUMBIA
04 MARCH 1987

REPORT NUMBER: 87-P70009 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1456 PST
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	300	2.5
LAST 90 DAYS	2	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The tail-wheel-equipped aircraft was cleared for takeoff on a 7,000-by-200-foot asphalt runway, in calm wind conditions. The pilot applied power and moved the control column forward. As the tail lifted, the aircraft yawed to the left. The pilot applied right rudder to counteract the yaw and centred the control column to maintain a level attitude. The aircraft then swung 20 degrees to the right of the runway heading. As the aircraft approached the right edge of the runway, the pilot closed the throttle and applied the brakes. The aircraft nosed down, and the propeller contacted the runway several times. The aircraft slid to a stop on its nose and returned to a three-point attitude.

The pilot, who had limited experience on a tail-wheel-equipped aircraft, had last flown that type of aircraft more than five months before the occurrence.

The flying club had a dispatch procedure in place whereby pilots would be dispatched to fly the Citabria only after specified qualification criteria were met. One such qualification stated the pilot must have flown the aircraft type within 60 days. In this instance, the pilot was inadvertently dispatched without having met the 60-day qualification criterion.

According to the Transport Canada Flight Training Manual, the recommended take-off technique for tail-wheel-type aircraft is to keep the tail wheel on the ground so that directional control may be maintained by means of the tail wheel steering. When speed has reached the point where both the elevator and rudder become effective, the nose is lowered to the take-off attitude.

When the pilot moved the control column forward at the start of the take-off run, the tail wheel lifted prematurely, thereby eliminating tail wheel steering as a means of directional control. As the aircraft yawed to the left in reaction to the effects of the propeller, the pilot overcorrected. The aircraft then swung to the right, and, to prevent it from running off the runway onto the grass, the pilot applied the brakes causing the aircraft to nose down.

FINDINGS:

Cause Related:
1. The pilot did not use the recommended take-off technique for tail-wheel-equipped aircraft.

2. The pilot overcorrected when the aircraft swung to the left.

3. The aircraft nosed down as a result of hard braking.

Other:

1. The pilot did not meet the currency requirements of the flying club's dispatch procedure.

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PIKANGIKUM AIR SERVICE
NORSEMAN MARK V C-FBSH
PIKANGIKUM, ONTARIO
11 MARCH 1987

BRIEF NUMBER: 87-C70009 (Accident)
LOCAL TIME: 0700 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	14,500	8,000
LAST 90 DAYS	150	110

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The wheel/ski-equipped aircraft was departing from an ice road on a frozen lake. During the take-off roll, the wheels broke through crusted snow, and the aircraft failed to accelerate. The aircraft then slid off the ice road, and the right main landing gear struck a snowbank. The right landing gear and the fuselage were damaged.

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PINEHOUSE AIRWAYS LTD.
PIPER PA-34-200T SENECA II C-GJMY
BUFFALO NARROWS, SASKATCHEWAN
17 MARCH 1987

REPORT NUMBER: 87-C70010 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1245 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,000	60
LAST 90 DAYS	90	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The charter flight was behind schedule. After take-off from La Loche, the pilot realized that the top door latch was not secured. He decided to return to the airport and landed downwind to save time. During the flare, a high sink rate developed; power was applied, but not in time to prevent a heavy landing. The pilot overshot and selected the gear up. Full aileron deflection and considerable rudder application was required to keep the aircraft flying straight. Ground personnel visually checked the aircraft during a fly-past and observed that the right gear was hanging down and that it was rotated 90 degrees to the normal position. The pilot decided to proceed to Buffalo Narrows Airport, about 60 miles away, where better facilities were available. The pilot conducted a successful emergency landing with the left main gear and nose gear extended. As speed was reduced, the right wing struck the runway.

During the first landing, the tail wind component was approximately six knots. The aircraft was in a right-wing-low attitude, and, on touchdown, it side-slipped to the right. Lateral forces exerted on the right landing gear leg caused the gear to fail in overload. The failure occurred at a point half-way up the shock strut just above the trunnion assembly bushing.

The pilot's reactions may have been affected by fatigue. He was preoccupied with business matters and had not received adequate rest during the previous few days.

Because the flight was behind schedule, pre-take-off preparations were rushed, and the top door latch was inadvertently left unlatched. The pilot decided to land and latch the door, and in order to expedite the landing, he chose to land downwind. Because a high sink rate developed prior to touchdown, recovery could not be effected in time to prevent the hard landing.

FINDINGS:

Cause Related:
1. During a hard landing, the right main landing gear failed in overload.

Other:
1. The aircraft door was not properly secured prior to take-off.

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BELVY AVIATION
CESSNA 185 SKYWAGON C-FMYN
MARY'S HARBOUR, LABRADOR
22 MARCH 1987

BRIEF NUMBER: 87-A70006 (Accident)
LOCAL TIME: 1220 AST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,000	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot of the wheel-ski-equipped aircraft was completing a charter flight with a load of freight on board. During a ski landing on the frozen harbour, the right main landing gear collapsed.

The sky was overcast, and, because of the light conditions, the pilot was unable to clearly see the snow surface roughness. The aircraft was landed on a rough, snow-drifted area.

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PROPAIR INC.
DHC 3 OTTER C-FRWK
CAMP PLACER, QUÉBEC
20 APRIL 1987

BRIEF NUMBER: 87-Q70008 (Accident)
LOCAL TIME: 1510 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,500	1,800
LAST 90 DAYS	151	90

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

REPORTED CIRCUMSTANCES:

The aircraft, with five occupants on board, was on a charter flight from Chibougamau, Québec to Camp Placer, 206 miles northeast of Chibougamau.

At destination, a sand runway, 2,200 feet in length and 100 feet in width and oriented east/west, had been built on an esker. On either side, there was a 100-foot gradient with a 30-degree slope. The wind was 210 degrees magnetic at about 20 knots. According to the operating manual, the wind exceeded the seven-knot cross-wind limitation for the aircraft. When the tail wheel touched down, the aircraft turned nose to the wind, left the runway, and came to rest at the bottom of the esker.

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PIPER PA-28R-200 CHEROKEE ARROW II
C-GDXX
LES CÈDRES AIRPORT, QUÉBEC
20 APRIL 1987

REPORT NUMBER: 87-Q70007 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1130 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	700	45
LAST 90 DAYS	30	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and his passenger were completing the second leg of a three-leg pleasure flight. During the landing roll, the nose landing gear collapsed, and the aircraft slid to a stop on the main landing gear and nose cowling.

The pilot was not certain whether he had selected the landing gear down during his pre-landing checks. On the final approach, the pilot added power to maintain the recommended approach speed, and the landing gear warning buzzer stopped sounding. A witness on the ground reported that the landing gear was not extended during final approach. After the accident, the landing gear extension lever was found in the down position; however, it could not be confirmed if this selection was made before the aircraft had touched down.

Post-occurrence landing gear tests confirmed that the landing gear extension system was fully functional. The main landing gear took approximately seven seconds to extend, and the nose landing gear took approximately 10 seconds. The Arrow II incorporates a back-up landing gear extension system which automatically lowers the landing gear if a combination of low airspeed and low engine power setting exists. Even when the landing gear is in the up position, if the engine power is advanced above approximately 14 inches of manifold pressure, the landing gear warning buzzer and the automatic gear lowering system will be disengaged. The buzzer indicating a gear-up situation and the stall warning buzzer, which is commonly heard during the landing flare, sound the same.

When the pilot added power to maintain the approach speed, the gear warning buzzer and the automatic gear lowering system were disengaged. These systems remained disengaged until the pilot reduced power in the landing flare. The nose gear did not have the required 10 seconds between selection and the application of aircraft weight to the nosewheel.

FINDINGS:

Cause Related:
1. The pilot did not select the landing gear down prior to commencing his final approach to land.

2. The nosewheel landing gear collapsed because there was insufficient time between the gear-down selection and the landing for the gear to complete its cycle and lock into place.

Other:
- Nil -

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NAV AIR CHARTER INC.
MITSUBISHI MU-2B-36 C-FTWO
VANCOUVER INTERNATIONAL AIRPORT, BRITISH COLUMBIA
29 APRIL 1987

REPORT NUMBER: 87-P74039 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0645 PDT
OPERATION: Contract
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	7,620	997
LAST 90 DAYS	270	96

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was taking off from runway 12 at Vancouver International Airport for a flight to Fort St. John, British Columbia. The aircraft was at a speed of 70 knots, when the pilot heard a loud bang, and the left engine fire warning light illuminated. The pilot rejected the take-off and shut down the engine. Airport fire-fighters extinguished the engine fire which had caused minor damage to the aircraft.

Examination of the engine, (Garrett Airesearch TPE331-6-252M) found that the second stage turbine wheel had disintegrated during the take-off roll. Examination of the engine turbine section showed that the second stage turbine stator seal plate assembly had contacted the second stage turbine rotor assembly and scored the rotor hub.

Garrett Turbine Engine Company had issued Service Bulletin TPE331-72-0522, Engine Turbine Section – Inspect Second Stage Stator Assembly. The bulletin stated that "severe warpage of the second stage turbine stator seal plate assembly could result in contact between the seal plate assembly and the second stage turbine rotor assembly. Subsequent engine operation could cause scoring of the rotor near the hub which could result in separation of the rotor assembly. " The bulletin detailed a radiographic inspection of the second stage seal plate assembly and the second stage rotor assembly to ensure adequate clearance between these parts. The Service Bulletin does not apply to the engine installed in the accident aircraft. However, the failure sequence described in the bulletin is identical to that discovered when the damaged engine was examined. Had this Service Bulletin been applicable to the engine installed in the accident aircraft, then the problem with this engine would have been discovered when the necessary inspection was conducted.

The CASB Engineering Laboratory concluded that the number two turbine wheel burst as a result of contact with the number two stage turbine stator.

FINDINGS:

Cause Related:
1. The number two turbine wheel burst as a result of contact with the number two stage turbine stator.

Other:
1. Service Bulletin TPE331-72-0522 did not apply to the engine installed in this aircraft.

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CESSNA C-172M SKYHAWK C-GUFO
BELOEIL AIRPORT, QUÉBEC
06 MAY 1987

REPORT NUMBER: 87-Q70011 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1500 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	277	70
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

After landing and clearing the runway, the pilot, with two passengers on board, taxied to the runway threshold to take off again for a local visual flight. Initial acceleration was normal; however, the pilot held the control column forward during the initial part of the take-off. When normal take-off speed was reached, the aircraft did not leave the ground when the pilot applied backward pressure on the control column. With 800 feet of runway remaining, the pilot reduced power and applied moderate pressure on the brakes to reject the take-off. Tire marks as a result of heavy braking commenced 150 feet from the end of the runway. The aircraft continued its run beyond the end of the runway and slid on the wet grass until it overturned into a ditch.

The front-seat occupants did not use the shoulder harnesses available; however, they were wearing their seat-belts. The pilot and front-seat passenger received minor injuries.

Runway 33 was in use, and there was a three-knot wind from 260 degrees. The runway measures 2,000 feet, and its extension consists of a 500-foot cleared field.

Weather conditions were favourable for visual flight, but it had rained in the morning.

The aircraft was airworthy, and the engine was operating normally. The weight and centre of gravity were within the prescribed limits.

According to the aircraft operating manual, the required distance for take-off in existing conditions was 680 feet (brakes released after applying full power). However, the take-off technique used by the pilot was not the recommended method. The manual recommends that the trim be placed in the neutral position before take-off and that the nosewheel be eased up at 55 knots. The pilot did not check the position of the trim before take-off. With the help of an inclinometer, it was established when the wreckage was examined that the elevator trim had an angle of incidence of 20 degrees upward, which would tend to make the aircraft pitch nose-down. The maximum trim travel is 28 degrees upward and 13 degrees downward.

With the elevator trim in this position, it was difficult for the pilot to turn the aircraft around at the recommended speed, using normal pressure on the controls, because the more the relative wind speed increased, the more the trim weighed down the nosewheel. Since the pilot hesitated to abort the take-off and to apply full braking action after the reduction in power, the aircraft left the runway at high speed. The braking action was ineffective on the wet grass, and the aircraft slid 500 feet to the ditch and flipped over.

FINDINGS:

Cause Related:
1. The aircraft did not take off because the elevator trim was in the nose-down position.

2. The pilot's hesitation in aborting the take-off and his moderate braking action on the runway caused him to overshoot the runway at high speed.

3. The wet surface of the runway extension made the braking action ineffective, and the aircraft flipped over on the edge of a ditch.

Other:
1. The front-seat occupants were not wearing their shoulder harnesses.

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URSUS AVIATION (102643 AVIATION LTD.)
CESSNA A185F SKYWAGON C-GWHD
WRIGLEY LAKE, NORTHWEST TERRITORIES
06 MAY 1987

REPORT NUMBER: 87-W70022 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1245 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	11,000	8,000
LAST 90 DAYS	200	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The ski-equipped aircraft had been chartered by the lodge owner at Wrigley Lake, Northwest Territories to transport some fuel and supplies from Fort Norman to Wrigley Lake. Upon arrival at the ice strip, the pilot carried out a normal full-flap landing. As the aircraft slowed down during the landing roll, directional control was lost, and the aircraft ground looped to the right; the left main landing gear collapsed, and the left wing was substantially damaged.

PERTINENT INFORMATION:

The pilot landed with full flap and with the tail wheel unlocked, as was his normal practice. He believed that a locked tail wheel caused problems with maintaining directional control. There were many parallel ruts and ridges on the strip made by snowmobiles during the initial packing of the strip; also, because of the temperature (plus 10 degrees Celsius), the snow on the strip was becoming soft, and there was water on the ice underneath the snow. While the aircraft was tracking slightly right of the runway heading, the tail wheel caught in one of the ruts.

The Cessna A185 pilot's operating handbook states that landings may be made with the tail wheel lock engaged or disengaged depending on the individual pilot's preference. The handbook states that, when landing on rough fields, the tail wheel lock should be engaged and that "engaging the tail wheel lock restrains the steering, making the tail wheel insensitive to rudder pedal action, and rocks and ruts on the landing surface. "

ANALYSIS:

As the aircraft slowed down during the landing roll, the tail wheel was caught in the ruts running almost parallel to the aircraft's direction of movement. The aircraft was tracking slightly to the right of the runway heading, and the ruts caused the unlocked tail wheel to move to the right of centre, thus initiating a swing to the right. The pilot attempted to correct for the swing by using rudder and power, but the offset tail wheel caused the aircraft to ground loop to the right.

FINDINGS:

Cause Related:
1. The combination of the unlocked tail wheel and the rough strip caused a loss of directional control and the resultant ground loop.

Other:
1. It was the pilot's practice to always land with the tail wheel unlocked.

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AIR SAHTU LIMITED
CESSNA 172B SKYHAWK C-GJNY
FORT FRANKLIN, NORTHWEST TERRITORIES
13 mi ESE
07 MAY 1987

REPORT NUMBER: 87-W70024 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1700 MDT
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,500	1,000
LAST 90 DAYS	50	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was advised that another company aircraft had made a forced landing on Great Bear Lake, and he departed Fort Frankly to locate the downed aircraft. Over the lake, he encountered a whiteout condition and attempted to turn around. In the turn, the aircraft descended and struck the snow-covered ice. The pilot sustained facial injuries and was rescued about one and one-half hours after the accident.

PERTINENT INFORMATION:

Pilot reports of weather conditions indicated that, at Fort Franklin, the ceiling was 1,000 feet and the visibility was three miles in snow just prior to take-off, and the weather conditions were deteriorating. When the pilot departed, the weather was marginal for visual flight rules (VRF) flight. The aircraft was not equipped to instrument flight rules (IFR) standards, and the turn coordinator had been removed. The aircraft was equipped with an artificial horizon, a compass, an airspeed indicator, and an altimeter. The pilot held a Class I instrument rating.

While over the lake, the pilot was flying at about 200 feet above ground level, just clear of the clouds, and was experiencing difficulty determining his actual height above the snow-covered ice because of the low light contrast. Once the pilot recognized the whiteout condition, he did not cross-check available flight instruments to assist in maintaining ground clearance.

ANALYSIS:

Because he felt an urgency to locate the downed aircraft, the pilot departed in marginal VFR weather conditions. When he encountered the whiteout conditions, he attempted to turn while using outside visual references. Because of the lack of contrast in the whiteout conditions, the pilot lost depth perception and inadvertently allowed the aircraft to descend.

FINDINGS:

Cause Related:

1. Because he felt an urgency to locate the downed aircraft, the pilot departed in marginal VFR weather conditions.

2. When he encountered whiteout conditions, the pilot lost depth perception and inadvertently allowed the aircraft to descend.

3. The pilot did not cross-check available flight instruments to ensure ground clearance.

Other:

-Nil-

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WEST CENTRAL AIRSPRAY (1985) LTD.
GRUMMAN G-164A AGCAT C-GANX
ALSIKE, ALBERTA 1 mi S
11 MAY 1987

REPORT NUMBER: 87-W70026 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1640 MDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	10,000	200
LAST 90 DAYS	150	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was applying the pesticide Malathion on a grove of trees. Three runs were made in a westerly direction into a five- to seven-knot wind. The approach to the grove of trees was over rising terrain. On the third run, the aircraft struck the tops of the trees; the pilot applied full throttle and jettisoned the load of chemical. The aircraft descended into the trees and was substantially damaged.

There was no indication of any pre-occurrence mechanical discrepancies, and the engine was developing power when the aircraft struck the trees. Fuel samples indicate that the aircraft was using an unauthorized grade of fuel, but this is not considered to be a factor in the occurrence.

The pilot had mixed and loaded the chemical prior to the flight without the use of protective equipment; he flew the aircraft with the cockpit side windows removed and did not use any type of respirator during the spraying operation.

The pesticide Malathion has a very low hazard toxicity rating, but it can affect the nervous system. The pilot did not report having experienced any symptoms and did not obtain a medical examination following the accident to determine his blood cholinesterase level, as is recommended by the provincial authorities. There was no indication of pilot incapacitation due to exposure to the chemical; however, by mixing and loading his own chemicals, by not wearing protective clothing or using a respirator, and by flying with the cockpit side windows removed, the pilot was exposing himself to the risk of incapacitation from the chemicals. Exposure to the chemicals would affect the pilot's judgement and alertness during the flight.

Because the approach to the spray run was into subsiding air, the climb performance of the aircraft was considerably reduced. This reduction in climb performance, combined with the rising terrain on the approach to the spray run, resulted in the aircraft striking the tree-tops and crashing.

FINDINGS:

Cause Related:

1. The pilot allowed the airspeed to decrease as the aircraft approached the spray area in subsiding air over an upslope.

Other:

1. The aircraft contained an unauthorized grade of fuel.

2. Normal precautions to prevent exposure to the chemicals used were not taken by the pilot, thus increasing the risk of a degradation in his judgement and

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NORTHLAND AIR MANITOBA LTD.
DOUGLAS DC-3C C-FADD
PICKLE LAKE, ONTARIO 2 mi W
11 MAY 1987

REPORT NUMBER: 87-C70022
DAMAGES: important

	Pilot-In-Command	Co-Pilot
Pilot Licence	Airline Transport	Airline Transport
Total Flying Time	9,130 hr	5,169 hr
Total on Type	5,500 hr	2,795 hr
Total Last 90 Days	224 hr	278 hr

Injuries:	Crew	Passengers	Others	Total
Fatal	2	-	-	2
Serious	-	-	-	-
Minor/None	-	-	-	-
Total	2	-	-	2

HISTORY OF THE FLIGHT:

On 11 May 1987, a Douglas DC-3C, C-FADD, was returning to Pickle Lake from Big Trout Lake, Ontario, following delivery of a cargo of fuel. This was the third similar and last operation of the day. The flight was being conducted under visual flight rules (VFR) and the two pilots were the sole occupants on board. As the aircraft approached Pickle Lake, the pilot informed the company dispatch office that, prior to landing, he intended to carry out some local training for the benefit of the co-pilot who was scheduled to be upgraded to captain status the following month. The captain, a company training pilot, occupied the right seat.

The aircraft entered a west to east holding pattern at the airport's non-directional beacon (NDB), descending in stages from 8,500 feet above sea level (asl) to 2,700 feet asl, the appropriate altitude for an instrument approach. The pilot transmitted that they would execute an NDB approach and subsequently reported during the procedure turn inbound to the airfield. About three minutes later, two other pilots flying in the vicinity observed the aircraft in a descent with the left wing folded upwards. The aircraft continued descending in an inverted attitude until it struck the ground. The accident occurred two miles west of Pickle Lake at 1800 central daylight time (CDT) during the hours of daylight, at lat 51°28'N, long 90°13'W at an elevation of about 1,215 feet asl.

PERTINENTS INFORMATION:

Two sets of radiographs were obtained from the radiologist who had been retained by the operator to carry out the SB 263 inspection. The sets were contained in dated envelopes.

The first set, reportedly taken in October 1986, was identified by aircraft registration and film position only. Two of the radiographs were identified as being from another DC-3 aircraft, and two were reported as being from an inspection carried out in January 1986. The second set, similarly labelled, was reported as being taken in January 1986. Individual radiographs were not dated, and it was impossible to relate them to a specific inspection. According to the Technical Log Book, inspections were carried out on 19 January 1986 and 23 November 1986. At the latter inspection, which occurred 297. 8 hours before the accident, the aircraft had accrued a total of 19,985. 9 hours.

The negatives were examined at the CASB Engineering Laboratory and by specialists from private industry.

During the examination of negative P4, reported to be from the 23 November 1986 inspection, no cracks were noted. However, negative P4, belonging to the set of radiographs dated January 1986, revealed a large skin crack approximately 15 inches in length which extended predominantly along the inboard flange rivet line. This crack line matched exactly the actual crack path on the failed wing.
Negative P1, from both sets, revealed similar crack indications. One appeared in the lower wing skin through a front spar fastener hole and another in the lower spar strap through an adjacent front spar fastener hole. On both negatives, the location of the indications matched the actual crack path found on the failed wing. Also, one of the P1 negatives revealed that the head and most of the bolt shank were missing on three bolt fasteners in the vicinity of station 127.50. It also revealed that an adjacent rivet was missing. The missing fasteners could readily detected during a visual inspection associated with SB 263, or any other periodic inspection.

The certified Level II radiographer who took the radiographs and who operated as a one-man company provided the operator with an inspection form which stated that there were no apparent defects. The radiographer retained the negatives on his company files.

A report dated 25 February 1980, prepared by another NDT company, covering the SB 263 inspection carried out on 20 February 1980, was submitted to the aircraft operator. The report states ". . . . station 127.750, x-ray view No. 3, exhibits a 1 1/2 inch crack indication in lower skin/flange on inboard side just aft of front spar. Crack extends through at least two rivet holes and does not appear to have been previously repaired. " The operator's technical personnel, who carried out a visual inspection, could not find any evidence of a crack and signed the Technical Log Book, indicating that the radiographic inspection was carried out. Subsequent inspection reports, submitted by a different NDT company, reported no apparent defects.

ANALYSIS:

The obvious separation of the left wing prompted investigation into a number of areas. The history of the aircraft and its use were examined. The possibility that the aircraft was subjected to in-flight overloads was also examined. The wing inspection documents and practices underwent detailed scrutiny, as did the process of aircraft structures radiography and the associated controls and standards.

The aircraft was imported into Canada in 1973 and was then flown at a rate of approximately 1,000 hours per year. This type of aircraft is used principally in passenger and cargo operations to northern Canadian communities. It is one of aviation's legendary machines, and it is known as a "workhorse" aircraft.

Operations from rough northern airstrips place a greater degree of wear on aircraft than those operating from paved runways. However, there was no evidence to indicate that the aircraft had experienced greater or less wear than other aircraft operating in a similar environment. There were no recorded instances of hard landings or flight through turbulence that could be considered contributory to the accident.

The lightly loaded aircraft was well within the weight and centre of gravity limitations and was being flown for local instrument training purposes in good weather conditions. The pilot had transmitted his intentions and followed them precisely. There was no evidence of flight crew incapacitation, and the possibility of the pilot overstressing the aircraft has been discounted.

The weight of evidence from examination of the wreckage and the laboratory analysis of the exhaust stacks leads to the conclusion that the engines were producing power at impact. The flight control system was examined, and no deficiencies were found. The trim positions were consistent with the flight profile being flown. Based on the result of these findings, it was concluded that an aircraft system malfunction did not precipitate an in-flight overload condition.

The wing failure occurred while the aircraft was being operated in normal flight conditions with all the necessary systems functioning satisfactorily.

Tests revealed that the left wing separated from the aircraft as a result of extensive fatigue cracking in the lower skin of the wing centre section in the vicinity of wing station 127. 750. Analysis of the crack indicated that the fatigue probably initiated at the second rivet hole aft of the edge of the skin adjacent to the front spar. The crack then propagated forward to the edge of the skin and aft to the centre spar, following the inboard rib flange rivet line for most of its length. The cracking of the skin was considered to be very high-cycle fatigue in nature, occurring over an extended period of flying time.

While the crack progressed through the skin, more and more of the wing loads were transferred to the stringers and to the front spar through the fasteners. The absence of the lower front spar fasteners outboard of station 127.750 and the relatively clean, undamaged condition of the fastener holes indicated that these fasteners had also failed progressively, prior to separation of the wing. The observed fatigue fracture of the most outboard fastener supports this assessed sequence of failure. The lower cycle nature of the crack propagation in the stringers indicated that the stringer failures occurred during the later stages of the wing failure.

The NDT specialists who examined the radiographs concluded that both the missing fasteners and the skin crack were detectable to a qualified radiographer.

The success of radiography is highly dependent on the judgement, skill, and thoroughness of the individual radiographer. In other areas of aviation maintenance, where critical functions require similar subjective interpretations, it is common practice for work to be examined by more than one person. There is no such requirement for radiography.

The apparent widespread omission of the dye-penetrant portion of SB 263 is another symptom of the lack of monitoring of NDT procedures. Given the location of the crack in C-FADD, it is unlikely that the dye-penetrant check would have confirmed the crack detected by radiography; however, a degree of hazard is introduced when any portion of a mandatory safety inspection procedure is omitted.

A 1½ inch crack indication at station 127.750 had been reported to the operator in 1980 by a different radiographer. However, according to the operator, the crack indication could not be confirmed following a visual inspection.

Had a thorough visual inspection been completed following the radiographic inspection of 23 November 1986, or any subsequent periodic inspection, the missing fasteners in the vicinity of station 127.750 identified on the radiographs would have been detected, even though the radiographer who had performed all the inspections except for the one in 1980 had advised the operator that there were no apparent defects. The bulletin required that a repair doubler be installed for any crack detected and confirmed. There are no documented cases of wing failures on aircraft equipped with the doubler.

The degree of ambiguity noted in the directions contained in SB 263 could lead to incorrect placement of the radiographic film and the radioactive source. This would result in incomplete coverage of the area to be inspected.

There have been eight revisions to SB 263, but some radiographers continue to use older versions. This stems from an inadequate distribution system and a weakness in surveillance.

The radiographic standards published in 48-GP-4M state that radiographers must maintain accurate records; there is no further amplification. None of the individual radiographs obtained in the course of the investigation was dated, and two were not labelled in any way. The correct identification of radiographs is essential to the overall process.

Document 48-GP-4M does not state a period of time over which radiographs must be retained. The radiographs could be destroyed immediately following examination, and one of the advantages of radiography, a permanent record, would be lost. Without such records, monitoring by a regulatory agency would be impossible.

Transport Canada's involvement in NDT certification is limited to membership in the NDT Standards Committees and does not extend to monitoring compliance with the standards established. This situation falls below the standard maintained by Transport Canada regarding other aviation-related maintenance activities such as engine overhauls.

CONCLUSIONS:

Findings:

1. The left wing failed in flight, under normal flight loads, as a result of a fatigue crack in the centre section lower wing skin in the vicinity of station 127.750.

2. A 15-inch fatigue crack was visible in radiographs taken at the normal inspection cycle, 297.8 hours of flight time before the accident, but was not interpreted by the radiographer.

3. Had a thorough visual inspection been completed following the radiographic inspection of 23 November 1986 or during subsequent periodic inspections, the missing fasteners would have been detected.

4. All the radiographic examination reports, except for the one performed by a different company on 25 February 1980, stated that there were no apparent defects.

5. The radiographs taken at the normal inspection cycle, 297.8 hours of flight time before the accident, showed that three bolt fasteners and an adjacent rivet were missing from the bottom of the front spar in the vicinity of station 127.750.

6. The visual inspection done by the operator following an inspection report dated 25 February 1980 which stated there was a crack indication at station 127.750 was not documented in the aircraft log books.

7. The requirement of SB 263 to conduct a dye-penetrant check in conjunction with the radiographic inspection was not fulfilled on this aircraft and on some other DC-3s operating in Canada.

8. Although SB 263 is ambiguous with respect to the placement of the radiographic film and the radiographic source, misinterpretation of SB 263 was not a factor in the accident.

9. Outdated versions of SB 263 are used by some radiographers.

10. The work of certified radiographers is not supervised or audited to the standard existing in other areas of aviation maintenance.

11. There are no aviation regulatory standards applicable to radiographic work performed on aircraft.

12. There were no recorded instances of hard landings or flight through turbulence that could be considered contributory to the accident.

13. An aircraft system malfunction did not precipitate an in-flight overload condition.

14. The structural failure was not the result of pilot-induced manoeuvres.

15. The flight crew was certified and qualified for the flight in accordance with existing regulations.

16. The aircraft was certified and equipped in accordance with existing regulations and approved procedures.

17. The weight and centre of gravity were within the prescribed limits.

Causes:
The left wing failed, under normal flight loads, as a result of a fatigue crack in the centre section lower wing skin. Anomalies in the radiographs taken during mandatory non-destructive testing inspections were not correctly interpreted.

SAFETY ACTION:

Action Taken:
Early in the investigation, it became evident that, with respect to the facility that had conducted the non-destructive testing (NDT) of DC-3 registration C-FADD, several anomalies existed regarding radiographic techniques and the interpretation of radiographs. Indications of cracks and missing fasteners, clearly evident on the radiographs, did not appear to have been interpreted as such. Consequently, the Canadian Aviation Safety Board issued an Interim Recommendation, on 10 June 1987, recommending that:

The Department of Transport initiate an immediate and complete audit of the NDT inspections, regardless of aircraft type, conducted by the company which carried out the recent X-ray inspections of the DC-3 aircraft, registration C-FADD.

CASB 87-15

In response, Transport Canada conducted an audit of all NDT inspections performed by the company responsible for the radiographic inspections of C-FADD. In cases where the necessary records could not be traced for any particular aircraft, the required inspections were repeated.

To further ensure the structural integrity of the wings of all Canadian-registered DC-3s, Transport Canada issued Emergency Airworthiness Directive (AD) CF-87-06 Douglas, effective 05 June 1987. The AD called for a review of the latest radiographs and aircraft technical records by qualified personnel; the repeat of Service Bulletin (SB) 263 if deemed necessary; and the incorporation of a wing skin doubler within 900 flight hours, 12 months, or the next wing removal, whichever occurred first.

As a matter of policy, the McDonnell-Douglas Corporation no longer issues service bulletins for their older aircraft; instead, they communicate any revised work instructions for these aircraft via service rework drawings. With respect to the DC-3, McDonnell-Douglas has now issued four rework drawings which provide revised inspection and modification data for compliance with SB 263. The drawings are more detailed than the original SB 263 (and revisions): they provide inspection area and access illustrations, radiographic film requirements, film-cutting instructions, radiographic source locations, and film placement and exposure data. In addition, the revised procedures specify a more detailed visual inspection and a radiographic inspection that includes the need for proper identification.

Following this accident, Transport Canada conducted a study of the present NDT situation throughout the industry in Canada. This study identified three major problems with the current Transport Canada policy. Their report recommended that the Canadian General Standards Board (CGSB) and MIL-STD-410 standards for the qualification and certification of NDT personnel be recognized as airworthiness standards and that the certification and release of NDT be done under Transport Canada company maintenance approval. This system would be applicable to all personnel performing and certifying NDT in the civil aviation industry, including manufacturing and maintenance organizations as well as aircraft maintenance engineers. In addition, the report recommended changes to the Transport Canada Curriculum Guide for the training of aircraft maintenance students on NDT knowledge, techniques, and applications; it also recommended increased Transport Canada surveillance of institutions accredited to teach this material. It is understood that these recommendations have been accepted and are currently being implemented.

Transport Canada is to be commended for their comprehensive follow-up to this occurrence. Full implementation of the Transport Canada study's recommendations will go a long way toward precluding a recurrence of the circumstances which led to this accident.

In the aircraft industry, almost all work is checked, tested, or supervised at various stages. In this occurrence, the individual performing the NDT, although certified to Level II, did the radiographic work without supervision, and the resulting radiographs were interpreted by him alone. Seeking a second opinion of a person qualified to interpret the radiographs taken of the wings of C-FADD would have increased the probability of detecting the anomalies extant.

According to N-AME-AO 12/84, "Standards For the Certification Of Nondestructive Testing Personnel", Level II or III CGSB certified NDT personnel are permitted to certify NDT work performed, and the airworthiness certification of the aircraft is then accomplished by an aircraft maintenance engineer (AME) endorsed in the appropriate category. However, many AMEs do not have the qualifications necessary to carry out NDT, nor are they capable of making valid judgments on the techniques of work performed by outside contracted agencies. Thus, the signature of the AME in certifying the airworthiness of the aircraft can often be a formality rather than a legitimate second opinion or "supervision" of the NDT work.

Supervisory personnel certifying the airworthiness of NDT work must be qualified in the NDT technique being performed in order to provide any credible second opinion. Since the interpretation of NDT results (particularly radiographic results) often requires the judgement gained through experience, knowledge and experience in the techniques used is required.

At present, the Transport Canada Airworthiness Manual (Chapter 571.209) requires an independent check of control systems "where any maintenance disturbs a system by which the flight altitude or propulsive force of an aircraft is controlled. " This occurrence demonstrates that mandatory radiographic testing of critical aircraft components also requires an independent check by a qualified person. Therefore the CASB recommends that:

The Department of Transport develop procedures for conducting an independent check by a qualified person of the results of any mandatory radiographic testing of critical aircraft components.

CASB 89-04

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CESSNA TU206G C-GCUZ
SIOUX LOOKOUT AIRPORT, ONTARIO
15 MAY 1987

REPORT NUMBER: 87-C70024 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1747 CDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	7,500	8
LAST 90 DAYS	126	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger departed Timmins on a visual flight rules (VFR) flight to Sioux Lookout, Ontario. The approach to land at Sioux Lookout was normal, but, on touchdown, the nose gear collapsed.

The aircraft was being operated within its required weight and centre of gravity range, and the pilot was unaware of any difficulty prior to landing.

The bolt attaching the nose gear drag link to the drag link attachment fitting had failed, allowing the nose gear to move ahead upon landing. The failed bolt (part number AN 5-30A) was forwarded to the Canadian Aviation Safety Board Engineering Laboratory in Ottawa for analysis. It was determined that the bolt had failed in shear overload. The bolt was not the type specified in the manufacturer's parts manual for this installation and it had a 21 per cent lower shear load application than the recommended bolt (NAS 464 P5A42). It could not be determined when the incorrect bolt was installed.

FINDINGS:

Cause Related:

1. An incorrect bolt was installed in the nose gear drag link.

2. The bolt failed in shear overload and allowed the nose gear to collapse.

Other:
-Nil-

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FRONTIER AIR
DE HAVILLAND DHC-2 BEAVER C-GDXY
KAPUSKASING, ONTARIO 5 mi S
17 MAY 1987

REPORT NUMBER: 87-O/70036 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1200 EDT
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,000	3,500
LAST 90 DAYS	40	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The float-equipped aircraft took off from the river on a non-revenue test flight for the condition and conformity inspection (CCI) certification. The first circuit was normal, and the aircraft returned for fuel. On the second take-off, the left wing struck low branches overhanging the river about 50 feet above the water. The wing was substantially damaged, and aileron control was lost. The pilot landed the aircraft safely in the nearest lake, 16 miles to the north.

PERTINENT INFORMATION:

On the first circuit, the pilot stated the wind was from 020 degrees at eight knots; however, on the second circuit, the wind had increased. The pilot departed the narrow river in a northerly direction into wind. When the aircraft became airborne, the pilot said the winds shifted to about 050 degrees at 10 to 15 knots, giving a 30-degree cross-wind. The wind at Kapuskasing at 1200 eastern daylight time (EDT) was reported as 020 degrees at eight knots, and the temperature was 4. 6 degrees Celsius. At 1300 EDT, the winds had veered to 060 degrees at six knots, and the temperature was seven degrees Celsius.

The take-off was normal until about 30 to 50 feet above the water when a downdraft or possibly wind shear prevented the aircraft from climbing normally. When the pilot realized that the aircraft would not clear the low overhanging branches, he attempted to turn away but found the controls to be very sluggish and unresponsive. The pilot did not recall what the airspeed was at the time, but the aircraft appeared to be slower than usual with take-off power. The pilot felt the impact but was not aware of the damage until he discovered that he was unable to move the ailerons. With only rudder and elevator control available, he climbed to 1,500 feet and decided to fly straight ahead and land in a lake to the north.

When the aircraft was examined, the left wing was found to be substantially damaged. Two large gashes in the leading edge indicated where tree branches had penetrated the wing. The left aileron had been jammed by the impact, allowing only about one inch of travel.

ANALYSIS:

Although the hourly weather reports did not indicate an increase in wind velocity, there was a 40-degree veer in the direction and a 2. 4-degree increase in temperature over the hour. With these rapid changes, turbulence can be expected. The aircraft encountered unstable air shortly after take-off and was unable to climb clear of trees in the departure path.

FINDINGS:

Cause Related:
1. Climb performance was degraded when the aircraft encountered turbulence.

Other:
-Nil-

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FOREST PROTECTION LTD.
CESSNA 172, C-GGEY
FREDERICTON, NEW BRUNSWICK
27 MAY 1987

BRIEF NUMBER: 87-A70013 (Accident)
LOCAL TIME: 1000 ADT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	750	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was flying a spotter aircraft during the annual New Brunswick budworm spray operation. He was returning to base when he saw a summer camp near the spray block. He decided to conduct a low-level reconnaissance of the camp to determine if it was occupied, because, if it were, the occupants would have to be warned about the spray operation.

As the pilot approached the camp, flying low along a river, the aircraft hit wires strung across the river. The pilot was unable to see the wires because they blended into the foliage surrounding the area. The aircraft was substantially damaged, but the pilot was able to maintain control and fly the aircraft safely back to base.

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ALTA FLIGHTS CHARTER LTD.
PIPER PA-34-200 C-GZOE
CRAWFORD BAY, BRITISH COLUMBIA
28 MAY 1987

REPORT NUMBER: 87-P70030 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0905 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	250
LAST 90 DAYS	120	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	5

SUMMARY REPORT:

The charter flight departed Calgary, Alberta at 0800 Pacific daylight time (PDT) on a visual flight rules flight (VFR) to transport golfers to Crawford Bay, British Columbia. While approaching Crawford Bay, the pilot selected full flaps and extended the landing gear for a straight-in landing on runway 32. On final approach, the aircraft was slightly higher and faster than the pilot would have liked it to be. The pilot elected to continue the landing, and the aircraft touched down approximately 1,000 feet past the threshold. The pilot then reduced the power to idle and retracted the flaps. When the brakes were applied, the aircraft began to skid sideways, and the pilot used rudder to control the skid. The brakes were ineffective in stopping the aircraft, which then skidded off the end of the runway at about 25 mph. As the aircraft left the overrun area, it entered a shallow ditch, and the left main gear was torn off. The nose gear and right main gear were torn from the aircraft as it crossed a highway, and the aircraft came to rest in the opposite ditch.

The turf runway measures 2,700 feet long by 75 feet wide, and the closely cropped grass surface is similar to a golf course fairway. At the end of runway 32, there is a 450-foot overrun, then a paved highway. There is also a 150-foot-tall tree located on private property, past the highway.

The pilot, who was experienced on the aircraft type, was attempting his first landing at this airport. On a hard-surfaced, bare and dry runway, the landing distance required for this aircraft is 1,978 feet.

At the time of the accident, there was an overcast sky condition estimated at 2,500 feet above ground level (agl), and the wind was calm. Up to 30 minutes before the accident, it had been raining for several hours.

Another company aircraft had landed and skidded off the side of the overrun of runway 32 approximately 15 minutes earlier. Because the other company pilot was concerned about fire, he evacuated his aircraft and did not report the slippery runway conditions to the accident pilot. The accident pilot saw the other company aircraft and assumed that it was parked at the end of the runway.

On final approach, the pilot realized that the aircraft was slightly high and fast and would touch down long. Since the leading company aircraft appeared to be parked at the end of the runway, the pilot thought that there would be no problem stopping, and he continued the landing. When he applied the brakes, the aircraft began to slip on the wet turf, and the pilot realized that he would be unable to stop on the runway. He did not attempt to overshoot because of the tall tree off the end of the runway.

CONCLUSIONS:

Findings:
1. The aircraft, which was slightly high and fast on approach, touched down long and could not be stopped on the slippery turf runway.

2. The pilot did not attempt an overshoot because of the tall tree off the end of the runway.

Causes:
The pilot landed the aircraft long on the wet grass runway and could not stop it within the remaining distance.

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ALTA FLIGHT (CHARTERS) LTD.
CESSNA 402A C-FMBG
CRAWFORD BAY, BRITISH COLUMBIA
28 MAY 1987

REPORT NUMBER: 87-P70029 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0755 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	11,000	350
LAST 90 DAYS	70	45

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	7

HISTORY OF THE FLIGHT:

The aircraft was on a visual flight rules (VFR) charter flight from Calgary, Alberta, to Crawford Bay, British Colombia. After a normal approach, the aircraft touched down 650 feet beyond the runway threshold. The pilot applied maximum braking immediately, but the aircraft skidded and overan the end of the runway. The aircraft then rolled through a depression and turned 90 degrees to the left, at which time the nosewheel and left main gear collapsed; the aircraft came to rest 410 feet beyond the end of the runway. There were no injuries.

PERTINENT INFORMATION:

The pilot was licensed and qualified for the flight. The aircraft was airworthy, and there were no pre-occurrence failures or malfunctions found.

The grass airstrip is 2,700 feet long and 75 feet wide. At the far end of the runway, there is a 180-foot overun, a shallow depression 115 feet wide, and a highway with a power line above it.

At the time of the accident, the short grass surface of the runway was wet from recent rain, and the wind was light and variable.

The pilot did not receive any report on the runway conditions before departure. He had landed and taken off from this strip successfully once before.

The Cessna 402A owner's manual shows that a minimum runway length of 1,825 feet is required for this aircraft to land at gross weight and with zero wind on a hard surface runway, under standard atmospheric conditions. This minimum length is increased by up to 30 per cent if the runway surface is wet grass, according to the Transport Canada *Flight Training Manual*, Third Edition. It is estimated that a minimum runway length of 2,400 feet was required for the aircraft to stop under the conditions present when the accident took place.

ANALYSIS:

The aircraft landed 650 feet long and was unable to stop in the remaining runway available. During the landing roll, the pilot decided not to attempt an overshoot because of obstructions at the end of the runway.

FINDINGS:

Cause Related:
1. The pilot did not receive any information on the runway conditions prior to departure.

2. The wet grass runway provided very poor braking action.

3. The aircraft touched down 650 feet beyond the runway threshold.

Other:
-Nil-

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PARI AIR LTD.
CESSNA 188A C-GYMN
HAZELDELL, SASKATCHEWAN 6 mi N
31 MAY 1987

REPORT NUMBER: 87-C70027 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 2015 CST
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	850	380
LAST 90 DAYS	75	80

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was about 300 feet above ground level en route to the aerial work area, when the engine lost all power. The pilot released the spray load and attempted a forced landing. When the pilot tried to avoid some trees, the aircraft stalled and landed heavily.

After he had released the load, the pilot saw that the aircraft was heading toward a stand of trees, and he pulled up sharply. He then pushed forward on the control column, attempting to land in a field, but the aircraft stalled about 20 feet above the ground.

The aircraft had flown nine flights without being refuelled, for a total flying time of 2 hours and 15 minutes. For this type of flying, the fuel consumption is 100 to 110 pounds per hour; the aircraft started with enough fuel for 2 hours and 18 minutes of flying time. The pilot had checked the fuel gauge before the accident flight, and, as it indicated one-quarter full, he believed he had sufficient fuel for another spray run.

The engine lost power because of fuel exhaustion, causing the pilot to carry out a forced landing.

Cause Related:
1. The aircraft's fuel supply became exhausted, resulting in the loss of engine power.

Other:
- Nil -

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CAMPBELL AIR LTD.
CESSNA 206 STATIONAIR C-GQOF
SELKIRK, MANITOBA 4 mi N
02 JUNE 1987

REPORT NUMBER: 87-C70028 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1915 CDT
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,000	100
LAST 90 DAYS	25	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot at the controls was seated in the left seat and was being checked out by the company owner/pilot who was seated in the right front seat. Touch-and-go landings were being carried out on the Red River in strong, gusty wind conditions. The circuit was normal with 30 degrees of flap selected prior to touchdown. On touchdown, the aircraft travelled about 50 feet on the water, became airborne, yawed and rolled right, and crashed into the river. The aircraft came to rest upside down, and both occupants escaped unharmed through the main rear door.

The pilot at the controls was highly experienced but had not flown float-equipped aircraft for 13 years. The aircraft was not equipped with dual controls, and the owner/pilot demonstrated an initial circuit and landing from the left seat. Following the demonstration, the pilots changed seats and completed a successful circuit and landing. As the pilot undergoing the check-out had float experience, there was no requirement for dual controls.

The winds were strong, causing two-foot-high waves, and the pilots selected another area that was less rough. However, this resulted in an approach and landing into a

40-degree cross-wind at speeds up to 25 knots. Following touchdown, a gust of wind caused the aircraft to become airborne, and it immediately veered and rolled to the right.

The combination of a lack of recent float experience and the strong, gusty cross-wind led to loss of directional control following landing; as the aircraft was not equipped with dual controls, the owner/pilot in command was unable to institute recovery action.

CONCLUSIONS:

Findings:

1. Aircraft control was lost during a landing in strong, gusty cross-wind conditions.

2. The pilot at the controls had not flown float-equipped aircraft for 13 years.

3. The aircraft was not equipped with dual controls.

Causes:

The pilot at the controls lost directional control of the aircraft while attempting to land in strong, gusty cross-wind conditions.

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ST-MAURICE AERO CLUB
CESSNA 172M SKYHAWK C-GUCI
YAMACHICHE, QUÉBEC
03 JUNE 1987

BRIEF NUMBER: 87-Q70015 (Accident)
LOCAL TIME: 0409 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,388	720
LAST 90 DAYS	143	65

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was making a planned stopover to pick up a passenger. Because of fog in the area, the pilot flew a tighter than normal circuit, which resulted in the aircraft crossing the runway threshold high and fast. The aircraft touched down near the half-way point of the runway, overran the runway at slow speed, and struck a ditch.

Although the pilot knew that he would land long, he thought that he could stop the aircraft on the runway remaining. After touchdown, the pilot discovered that braking action was very poor because the grass surface was wet. Because of trees and wires at the departure end of the runway, the pilot decided not to attempt a go-around.

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DIAMOND AVIATION CO.
NOORDYN – MK VI NORSEMAN N538DL
BRONSON CREEK, BRITISH COLUMBIA
04 JUNE 1987

BRIEF NUMBER: 87-P70902 (Accident)
LOCAL TIME: 1530 PDT
OPERATION: International Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial (U. S. A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,400	220
LAST 90 DAYS	200	140

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot landed the aircraft on the airstrip at Bronson Creek, British Columbia, and, on the landing roll-out, the left wheel and axle separated from the landing gear strut. The strut dug into the soft gravel runway, and the aircraft nosed over.

The aircraft's landing gear had just been changed from a wheel/ski combination to a wheels-only configuration. During the conversion, the bolt that holds the left wheel axle in place was not installed, and the asssembly came apart on landing.

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FOREST PROTECTION LTD.
GRUMMAN TBM-3 AVENGER C-GLEH
BOSTON BROOK, NEW BRUNSWICK
06 JUNE 1987

REPORT NUMBER: 87-A70014 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0613 ADT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Destroyed
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	12,035	485
LAST 90 DAYS	N/A	35

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

Three Avenger aircraft departed at 0550 ADT hours for spraying operations to the northeast of the Boston Brook camp airstrip. During the initial spray run, the lead aircraft developed a mechanical problem, and the pilot decided to return to the airstrip, escorted by the other two aircraft. Approaching the airstrip, the lead aircraft broke to the left, completed a right-hand circuit, and landed on runway 03 without further incident.

The number two aircraft took over as the lead aircraft but, before returning to the spray block, the pilot overflew the airstrip. The pass was made in a southwesterly direction at an altitude estimated by witnesses to be 10 to 15 feet above ground level (agl). When the aircraft approached the threshold of runway 21, it started a climbing right-hand turn to avoid a flag-pole with a wind sock on it; as the aircraft rolled to the right, the right wing struck a hydroelectric cable and then several trees. The aircraft continued to roll to the right, travelled a further 1,075 feet, and hit a trailer before striking the ground. It came to rest in an inverted position in some trees, 90 feet beyond the trailer.

PERTINENT INFORMATION:

The weather was not a factor; on the morning of the accident, the ceiling was 3,500 feet overcast with unlimited visibility and good light conditions.

The 30-foot flag-pole was located to the right-hand side of runway 21 in an open marshalling area next to the runway threshold. The hydroelectric cable was 40 feet agl and was strung between poles across the camp access road. The poles were situated to the right of the runway and were 300 feet beyond the flag-pole. Trees, 65 to 70 feet high, bordered the road.

The hydroelectric cable snapped when it was struck by the right wing. The pilot attempted to make the aircraft climb, but, the right wing began to pass through the trees. The wing chopped six feet off the top of one pine tree and 18 feet off the top of another, 240 feet beyond the initial cable strike.

The outboard section of the right wing, four feet in length, was torn off, and it fell into the trees; although the aileron remained attached to the wing, the aileron hinges were damaged and dislodged. The aircraft continued to roll while passing over the camp, and, just before the aircraft struck the ground in an inverted attitude, the right wing sliced through a trailer in the camp ground, 1,165 feet from the trees.

The weight of the aircraft at take-off was 16,205 pounds which is below the maximum allowable weight of 17,600 pounds. The weight of the fenitrothion spray at take-off was 3,000 pounds, and, after two spray runs, this weight would have been slightly reduced. The pilot did not have time to dump the load, so the crash scene was saturated with the spray fluid. Company personnel quickly took precautions to neutralize the spill; but, extreme caution had to be taken while completing the on-site investigation of the accident.

The autopsy on the pilot, performed the day after the accident, showed that there was no evidence of any disease; however, a toxicological analysis of blood and urine samples indicated a relatively high ethanol (alcohol) concentration. The autopsy showed a blood-alcohol concentration of 89 milligrams per 100 millilitres (mg%) and a urine-alcohol concentration of 254 mg%; these alcohol concentrations and the relationship between them indicate the amount of alcohol consumed, the elapsed time since consumption, and the condition at the time of death. For this urine-alcohol concentration level to be reached, the blood-alcohol concentration would have been about 195 mg% at some time prior to death, indicating that, with a normal blood-alcohol elimination rate of 15 mg% per hour, seven or eight beers or measures of liquor would have been consumed about seven hours before death; these values are estimates. Under the Canadian Criminal Code, it is an offense to operate a motor vehicle, vessel, or aircraft with an alcohol concentration exceeding 80 milligrams per 100 millilitres of blood.

Because of poor weather conditions, there had not been any spraying operations for two days before the accident. The crews retired for the night at about 2330 ADT in anticipation of good weather and an early start the following morning.

ANALYSIS:

Overflying the airstrip before returning to the spray area is an acceptable practice to allow a pilot who is not normally flying the lead aircraft to orient himself towards the spray area; however, it is not customary to overfly the airstrip at such a low altitude.

When the pilot observed the flag-pole, he attempted to avoid it by banking the aircraft and starting a climb. Although he managed to clear the flag-pole, there was not enough time or space to avoid hitting the hydroelectric cable or the trees. When the aileron was damaged, controlled flight was no longer possible.

The toxicological analysis of the pilot's blood and urine showing an elevated concentration of ethanol indicates that the pilot was suffering a hangover at the time of the accident. The concentration of alcohol was high enough to reduce the pilot's visual perception, mental alertness, and reaction time and to affect his judgement. This could account for the pilot's decision to overfly the airstrip at such a low altitude and also explain why the pilot was unsuccessful in reacting fast enough to prevent the aircraft from striking the cable and the trees.

FINDINGS:

Cause Related:
1. The right wing of the aircraft struck a hydroelectric cable and some trees.

2. The damage to the right aileron resulted in loss of control of the aircraft.

3. The toxicological analysis of the pilot's blood and urine revealed high ethanol content, sufficient to affect the pilot's judgement and to impair his performance.

Other:
-Nil-

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WOOD-WIND AERO LTD.
PIPER PA-25-235 PAWNEE C-GJIK
WESTPORT, ONTARIO
07 JUNE 1987

REPORT NUMBER: 87-O/70044 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1906 EDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,410	21
LAST 90 DAYS	125	21

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

During the take-off roll, the aircraft began to porpoise, and the pilot decided to abort the take-off. The aircraft overran the runway and nosed over in the furrowed ground at the end of the runway.

The runway, oriented east/west, was 3,000 feet long. The first 1,700 feet consisted of gravel and oil, and the remaining 1,300 feet was grass. Because of the brief rain showers earlier in the day, the grass portion of the runway was damp and soggy. There was a small cultivated garden 20 feet past the end of the runway.

The aircraft was being used to spray insecticide and took off with a full hopper of insecticide and a full fuel load. The pilot stated that the take-off was normal until the aircraft transitioned from the compacted gravel portion of the runway onto the grass portion. The aircraft porpoised twice, and some of the insecticide splashed out of the hopper onto the windscreen, obscuring the pilot's vision. The pilot then decided to abort the take-off.

Ground marks indicated that the pilot began braking the aircraft about 1,000 feet from the edge of the compacted gravel portion of the runway, leaving about 300 feet to the end of the runway. The pilot stated that the tires slid on the wet grass, preventing the aircraft from stopping before it ran off the runway.

The take-off was aborted, and there was insufficient runway remaining.

FINDINGS:

Cause Related:
1. The take-off was aborted, and there was insufficient runway remaining.

Other:
-Nil-

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CESSNA 185F C-GMDA
REPENTIGNY, QUÉBEC
11 JUNE 1987

REPORT NUMBER: 87-Q70017 (Accident)
INFORMATION SOURCE: Field Investigation
DATE: 11 June 1987
LOCAL TIME: 1813 EDT
OPERATION: N/A
DAMAGE: Destroyed
PILOT LICENCE: None

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500 (estimated)	500 (estimated)
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

In the early evening, the floatplane was observed doing low-level manoeuvres over the city of Repentigny, Québec. During one such manoeuvre, the airplane pulled up suddenly, banked to the right, and nosed down into the water. It sank immediately. On impact, the floats were torn off the airplane and drifted away. Rescue workers went to the scene but were able to retrieve only a few objects from the aircraft that were floating in the river. A thorough search was conducted over a period of several days, but the pilot was not found. His body was found seven days later, but the aircraft was not recovered.

PERTINENT INFORMATION:

The aircraft, which was jointly owned by two individuals, was docked at Laval, Québec. The pilot spent the afternoon drinking alcoholic beverages with a group of friends. Because of his condition after drinking the alcohol, the pilot's friends drove him home in his own vehicle. A few hours later, he drove his vehicle from his home to the Commodore Yacht Club dock. He took the keys to the accident aircraft without the owners' permission.

After take-off, the pilot performed a number of low-level manoeuvres in the area of the dock, then flew toward the city of Repentigny. Several witnesses stated that he carried out low-level manoeuvres followed by sudden pull-ups near the houses along the river. During one such pull-up manoeuvre, the aircraft banked to the right and nosed down into the water at high speed.

Witnesses stated that the airplane seemed to be functioning normally, and there were no indications of any mechanical defects that could have contributed to the accident. Weather conditions were not a factor in the accident.

Toxicological analysis revealed that alcohol was present, but, as the pilot's body had been in the water for a long period of time, it was not possible to determine the exact percentage of alcohol involved. Air Regulation 409 states that crew members must not consume alcoholic beverages in the eight hours before flight time.

The pilot had received his training from a commercial pilot. He flew for some years but did not hold a pilot or student pilot licence.

ANALYSIS:

While pulling up suddenly at low altitude, the pilot lost control of his aircraft, and it crashed into the water. It is probable that the effects of alcohol prevented the pilot from maintaining directional control of the aircraft while doing the low-level manoeuvres.

CONCLUSIONS:

Findings:
1. The pilot consumed alcohol a short time before the flight.

2. The pilot performed low-level manoeuvres and lost control of the aircraft, which then crashed into the river.

3. The pilot was not licensed.

Causes:
It is probable that the effects of alcohol prevented the pilot from maintaining directional control of the aircraft while doing low-level manoeuvres.

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CESSNA 150 COMMUTER C-GSAZ
SPRINGBANK AIRPORT, ALBERTA
15 JUNE 1987

REPORT NUMBER: 87-W70037 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1530 MDT
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	156	72
LAST 90 DAYS	28	28

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

Shortly after the aircraft was cleared to the circuit for a landing, the engine lost power. A forced landing was made onto a field just short of the runway, and, after touchdown, the nosewheel hit a badger hole causing substantial damage to the aircraft.

Investigation of the aircraft's fuel system revealed that less than two U. S. gallons of fuel remained; the unusable fuel volume of this system is 3. 5 U. S. gallons. The pilot reported that, on his pre-flight inspection at Namao, before departing for Springbank, the fuel level was visually determined to be just under three quarters, and he considered it unnecessary to refuel the aircraft. The pilot used the long-range fuel tank tables from the cruise performance section of the owner's manual to calculate the aircraft's range for the flight; however, the aircraft was equipped with standard fuel tanks.

The aircraft engine failed from fuel exhaustion because the pilot did not use the appropriate information for calculating the aircraft's range.

CONCLUSIONS:

Findings:
1. The flight was planned using the long-range fuel tank tables from the owner's manual for an aircraft that had standard fuel tanks.

2. The engine stopped because of fuel exhaustion.

Causes:
The long range fuel tank tables were used in flight planning for an aircraft equipped with standard fuel tanks, resulting in fuel exhaustion.

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CALM AIR INTERNATIONAL
DOUGLAS DC-4 C-GPFG
HIDDEN BAY AIRSTRIP, SASKATCHEWAN
16 JUNE 1987

REPORT NUMBER: 87-C70039
DAMAGE: Substantial

	Pilot-In-Command	Co-Pilot
Pilot Licence	Airline Transport	Airline Transport
Total Flying Time	9,500 hr	5,540 hr
Total on Type	1,680 hr	1,040 hr
Total Last 90 Days	305 hr	280 hr

Injuries:	Crew	Passengers	Others	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	4	-	-	4
Total	4	-	-	4

HISTORY OF THE FLIGHT:

On 16 June 1987, a Calm Air International Douglas DC-4 aircraft, C-GPFG, was chartered to move cargo from Hidden Bay, Saskatchewan to Kasba Lake in the Northwest Territories. The aircraft and crew of four were on the return flight under visual flight rules (VFR) and were conducting an approach and landing to runway 36 at the Hidden Bay Airstrip, in a cross-wind from the right. The pilot flying was the first officer, who was in the right seat.

After the landing gear and full flap were lowered, the aircraft's speed was reduced to 100 knots. As the aircraft crossed the threshold, the crew heard a thump, and the aircraft skipped 40 to 50 feet and then touched down on the runway. As the weight of the aircraft came onto the landing gear, the right main gear unsafe light illuminated. The captain took control of the aircraft, completed the landing roll, and taxied to the parking area. During shutdown, fuel was seen leaking onto the right main gear assembly. The shutdown check was completed, and the aircraft was evacuated.

The accident occurred at 1450 central daylight time (CDT) during the hours of daylight, at lat 58°08'N, long 103°47'W, at an Elevation of 1,444 feet above sea level (asl).

PERTINENT INFORMATION:

The speeds selected for the approach and threshold crossing were appropriate for the conditions. The crew were familiar with the runway environment and had operated from the strip that day. The fact that the first officer was conducting the approach and landing was not considered to be a factor, as he had done this many times before and the practice was in keeping with company policy. Both pilots stated that the approach appeared to be normal.

The 3,940-foot long runway was long enough for the aircraft type, but pilots normally tried to touch down close to the threshold of the runway to have maximum stopping distance.

ANALYSIS:

As the aircraft was found to be serviceable, the investigation concentrated on the operational aspects of the occurrence.

Both pilots were experienced on the aircraft type and were familiar with the runway environment. The aircraft was landing in good visual conditions with a 90-degree cross-wind from the right at 12 knots. The fact that only the right main landing gear struck the lip at the runway threshold indicated that the right wing was low at the time of impact; this attitude was consistent with the landing technique required to counter a cross-wind. During the approach, both pilots were satisfied with the attitude and altitude of the aircraft.

The investigation concluded that the pilots misjudged the aircraft's altitude while landing in a cross-wind, and the right main landing gear struck the lip at the threshold of the runway.

CONCLUSIONS:

Findings:

1. The lip at the threshold of the runway was 10 feet deep.

2. The right main wing landing gear struck the lip at the threshold of the runway.

3. The flight crew was certified and qualified for the flight in accordance with existing regulations.

4. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

5. There was no evidence found of any airframe failure or system malfunction prior to or during the flight.

6. The weight and centre of gravity were within prescribed limits.

Causes:
The Canadian Aviation Safety Board determined that the crew misjudged the altitude of the aircraft while landing in a cross-wind.

SAFETY ACTION:

The Board has no safety recommendations to issue at this time.

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GENERAL AIRSPRAY LTD.
GRUMMAN G-164A AG-CAT C-GFML
CLAIRVILLE, NEW BRUNSWICK
16 JUNE 1987

REPORT NUMBER: 87-A70017 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2020 ADT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,500	200
LAST 90 DAYS	100	53

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The aircraft was engaged in a forest insecticide spray program and was completing a spray run when the pilot noticed that a vibration had developed. The pilot shut down the spray pump, thinking that it was the cause of the vibration, but then noticed that the engine (Pratt & Whitney R985-AN1) was vibrating, and puffs of smoke were coming out of the exhaust. A short time later, the engine started to lose power. The pilot then jettisoned the spray load and set up an approach to a field about two miles past the end of the spray block. The engine continued to lose power, and the pilot, realizing that he would not be able to reach the selected landing area, landed the aircraft straight ahead in a lower part of the field. Just before touchdown, the windscreen became covered with oil and the engine stopped. The touchdown was normal, but, during the landing roll, the tires sank into soft ground, and the aircraft nosed over.

PERTINENT INFORMATION:

Examination of the engine after the accident showed that the top portion of the connecting rod and the number one piston pin had broken into a number of small pieces, the largest of these being one inch long; these pieces were found inside the crankcase. The connecting rod and piston for the number one cylinder were forwarded to the Canadian Aviation Safety Board Engineering Laboratory for further examination. The piston pin for the number five cylinder was also sent for comparison, as the piston pin for the number one cylinder was damaged beyond recognition.

ANALYSIS:

The laboratory analysis determined that the number one connecting rod had failed in overload. Although it was not possible to examine the number one piston pin due to the damage it had sustained, the breakup and severe pounding damage in the piston pin boss area inside the number one piston suggested that the failure sequence started with the failure in fatigue of the piston pin, followed by the failure of the connecting rod in overload.

Examination of the piston pin for the number five cylinder determined that it was a light duty pin rather than the heavy duty pin recommended in Pratt & Whitney Service Bulletins 1443 and 1730. It is possible that a light duty piston pin was installed in the number one cylinder. An investigation of a similar engine failure, CASB report number 80-W00099, revealed that it was caused by fatigue failure of a light duty piston pin.

CONCLUSIONS:

Findings:

1. The failure sequence started with the failure of the number one piston pin.

2. The number one cylinder connecting rod failed in overload.

3. The piston pin for the number five cylinder was a light duty pin rather than the heavy duty pin recommended in Pratt & Whitney Service Bulletins 1443 and 1730.

4. The aircraft nosed over during the forced landing because the tires sank into the soft ground.

Causes:

The Canadian Aviation Safety Board determined that the engine power loss was caused by the failure of the number one cylinder piston pin, probably because it was of a lighter strength than that recommended by the manufacturer.

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MANITOBA GOVERNMENT AIR SERVICES
CANADAIR CL215 C-GUMW
THOMPSON, MANITOBA
16 JUNE 1987

REPORT NUMBER: 87-C74034 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1500 CDT
OPERATION: Specialty Aerial Control
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	19,000	1,500
LAST 90 DAYS	150	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was engaged in fire suppression and had just picked up a load of water from a nearby lake, when the pilot felt a severe vibration coming from the left engine. The pilot jettisoned the load, feathered the propeller, and shut down the engine. Only two of three propeller blades feathered, but the pilot was able to return to Thompson and land safely.

Since manufacture, the propeller (Hamilton Standard model 43E60) had accumulated 84 hours in service. During disassembly, it was determined that the blade bushing screws and the blade drive pins that secure the blade bushing to the number two (unfeathered) blade, had failed in shear. The blade thrust washer had a radial crack running completely through it.

The manufacturer examined the propeller and found the number two blade to be deformed slightly rearward. This varied from the other two blades, and, as there was no evidence of leading edge damage, was indicative of static blade impact. The damage is typical of a blade struck during towing or service equipment operations; the strike could have occurred at any time prior to this incident.

The thrust washer initially cracked at blade impact and eventually the crack propagated completely through the washer. The sharp edges of the crack scraped out an area inside of the barrel arm and caused the thrust washer to jam against the wall. This resulted in enough resistance that the torque required to change blade angle became greater than the shear strength of the blade bushing screws and the blade drive pins. The screws and pins eventually sheared, and the blade bushing separated from the blade. The blade, now independent of the remaining two blades, assumed a different pitch angle which resulted in excessive propeller vibration.

CONCLUSIONS:

Findings:

1. The number two blade was deformed slightly rearward because of static blade impact.

2. The blade thrust washer cracked at impact and eventually jammed, causing the number two blade bushing screws and drive pins to shear.

3. The blade bushing separated from the number two blade resulting in a different blade pitch angle and excessive propeller vibration.

Causes:

The number two propeller blade had previously received static impact damage.

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CESSNA 188 AGTRUCK C-GCDT
VIRDEN, MANITOBA 10 mi W
18 JUNE 1987

BRIEF NUMBER: 87-C70043 (Accident)
LOCAL TIME: 2130 CDT
OPERATION: Private Aerial Spray
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,500	1,500
LAST 90 DAYS	60	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was conducting a spray run and was flying into the sun at a height of 10 feet above ground level. The aircraft landing gear collided with a bulldozed pile of brush, and the left main gear leg separated from the aircraft. The pilot returned to his farm strip and conducted a successful emergency landing. The wind was less than five mph, and the weather was good.

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LABRADOR AIRWAYS
DE HAVILLAND DHC-6-300 TWIN OTTER
C-GNQY
GOOSE BAY, LABRADOR
22 JUNE 1987

BRIEF NUMBER: 87-A70019 (Accident)
LOCAL TIME: 0635 ADT
OPERATION: Commercial Non-Scheduled
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,560	912
LAST 90 DAYS	345	291

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

During start of the right engine, the aircraft rolled forward about 15 feet, and the propeller struck the right elevator and the rudder of a parked Beechcraft Queenair aircraft. The brakes and nosewheel steering failed to operate, and the collision could not be avoided.

The aircraft had been parked for a couple of days, and, during that time, the pressure in the hydraulic brake accumulator had bled off, and the crew did not notice the low pressure prior to engine start. As well, the hydraulic circuit-breaker was out during engine start; therefore, hydraulic pressure did not build up for brake operation and nosewheel steering. Both the circuit-breaker and the pressure gauge are items on the pre-start check-list.

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NORTH-EAST AG SERVICES LTD.
CESSNA A188B AG-TRUCK C-GPBJ
BURLINGTON AIRPARK, ONTARIO
24 JUNE 1987

REPORT NUMBER: 87-O/70050 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1530 EDT
OPERATION: Inspection, Reconnaissance and Advertising
DAMAGE: Substantial
PILOT LICENCE: Senior Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,413	9
LAST 90 DAYS	216	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

During the landing roll on runway 32, the left wing suddenly rose, and the aircraft ground looped to the left before departing the runway in the same direction. The aircraft came to rest in the grass on an easterly heading, 62 feet from the runway.

The aircraft approached with 20 degrees flap at 80 mph and touched down in a three-point landing. During the landing roll, the pilot stated that a gust of wind caused the left wing to rise, and the aircraft veered to the left. In response, the pilot applied left aileron, right rudder, and full brakes, in an attempt to regain directional control. At the same time, the pilot inadvertently knocked his elbow against the power lever, increasing the power. The pilot then quickly retarded the power lever as the aircraft ran off the runway, ground looping 270 degrees to the left.

One-half hour before and after the occurrence, the wind at a reporting station 15 miles from the accident site was 290 degrees true at 03 knots, and 350 degrees true at 02 knots respectively. The pilot had accumulated nine hours on this type of aircraft and 32. 5 hours total on tail-wheel-equipped aircraft, in the preceding six months.

The pilot, who had limited experience on tail-wheel-equipped aircraft, lost directional control of the aircraft during the landing roll and could not prevent the aircraft from ground looping.

FINDINGS:

Cause Related:
1. The pilot lost directional control of the aircraft during the landing roll and could not prevent the aircraft from ground looping.

Other:
-Nil-

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PARACHUTE SCHOOL OF TORONTO LIMITED
CESSNA U206-A C-FSSU
ARTHUR NORTH AIRPORT, ONTARIO
11 JULY 1987

REPORT NUMBER: 87-O/70054 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1125 EDT
OPERATION: Specialty Recreational Flying
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	270	60
LAST 90 DAYS	58	48

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	6

SUMMARY REPORT:

The aircraft, carrying the pilot, five student parachutists and a jump master, was attempting to take off from runway 26 at the Arthur North Airport, Ontario. Just as the aircraft lifted off the runway, the engine (Continental IO-520-A) lost power momentarily; the take-off was continued, but the right wing dropped, and the aircraft struck the ground at the end of the runway.

The length of the runway, not including the displaced threshold at each end, was approximately 1,900 feet. The calculated distance required for this aircraft to take-off and clear a 50-foot obstacle, under the existing conditions, was approximately 1,866 feet, with 20 degrees of flap extended.

Examination revealed that the engine-driven fuel pump vapour ejector was blocked with a black, rubber-like substance which prevented operation of the vapour ejector; the vapour ejector returns fuel vapours that form in the pump to the aircraft fuel tank. One of the six engine fuel injector nozzles was also found to be partially blocked with a small sliver of a metallic substance.

Although a flap setting of 20 degrees is used for short-field take-offs in this type of aircraft, the accident aircraft was found to have about 13 degrees of flap extended.

The passengers were not using seat-belts at the time of the accident, nor had they been instructed on the use of the seat-belts prior to take-off. The aircraft was registered and operated commercially, but the pilot held a private licence. The aircraft was at maximum gross weight.

The malfunctioning fuel pump vapour ejector caused the engine to lose power momentary at a critical point in the take-off. The length of runway remaining when the power loss occurred left the pilot without sufficient room to reject the take-off. The partially blocked fuel injector nozzle resulted in an incorrect fuel/air mixture in one cylinder, thus reducing the available engine power. This, combined with the interruption of power at lift-off, prevented the aircraft from accelerating sufficiently to climb out after lift-off, and the aircraft struck the ground at the end of the runway.

FINDINGS:

Cause Related:

1. The vapour ejector in the engine-driven fuel pump was blocked, causing a momentary interruption of power at lift-off.

2. The fuel injector nozzle in one cylinder was partially blocked, thus reducing the amount of power produced by the engine.

3. With the reduction in engine power, the aircraft was unable to take off successfully.

Other:

1. The passengers were not briefed on the use of the aircraft seat-belts, nor were the seat-belts in use.

2. The commercially operated aircraft was flown by a pilot licensed for private pilot privileges.

3. The aircraft flaps were incorrectly set for take-off.

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WORLDWIDE AIR CHARTER TRANSPORT SYSTEMS INC.
MCDONNELL-DOUGLAS DC-8F-55 C-FDWW
TORONTO/LESTER B. PEARSON INTERNATIONAL AIRPORT, ONTARIO
12 JULY 1987

REPORT NUMBER: 87-O/74142 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2108 EDT
OPERATION: International Charter
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	20,000	300
LAST 90 DAYS	60	60

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	4
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

Flight 102, a freight charter, departed from runway 33 at Toronto/Lester B. Pearson International Airport for Santa Maria, Azores. Shortly after take-off, as climb power was reduced at approximately 1,100 feet above ground level (agl), the number three engine fire warning illuminated. The recommended procedures were completed, and the engine was shut down. Moments later, the number four engine fire warning illuminated. The engine power was reduced, and the engine fire warning light went off.

The captain commenced a turn to climb towards the designated fuel dumping area, planning to reduce the fuel load to meet the aircraft's maximum landing weight. As climb power was applied to the remaining three engines, the number four fire warning illuminated again. The plan to dump fuel was cancelled, and the aircraft was returned to the airport to land immediately.

On landing, only three of the four reversers were available, and heavy braking was necessary to stop the aircraft. The Crash Fire Fighting Rescue (CFR) equipment was standing by, and, when the aircraft came to a stop, the hot main landing gear wheels and brakes were immediately foamed. The pilots had heard the fire-fighters advising the tower on the radio that the landing gear was on fire, and, as soon as the aircraft stopped, the crew evacuated the aircraft.

To evacuate the aircraft, the first officer used the rope by his side window to slide down. The remaining three crew members used the rope by the forward main door;

when the panel was removed to expose the rope, they found it to be heavily taped, and it required some time to untape it, thus delaying their escape.

Maintenance personnel reported that there were leaks in the bleed air ducts of both the numbers three and four engines close to the fire warning wire loops. These leaks resulted in the false fire warnings in the cockpit. On this aircraft, there is only one indication for both an engine overheat and engine fire, and the crew always treats the warning as an engine fire.

ANALYSIS:

Leaks in the bleed air ducts of the numbers three and four engines activated the engine fire warnings, and the captain elected to make an emergency landing without dumping fuel.

The smoke from the landing gear was a result of the brakes becoming excessively hot when they were applied harder and longer than normal to compensate for the reduced thrust reverser effect and to slow down the heavily laden aircraft.

FINDINGS:

Cause Related:

1. Hot air leakage from the bleed air duct which occurred close to the fire warning wire loops of the numbers three and four engines triggered the fire warning lights in the cockpit.

2. Heavy braking with the aid of only three thrust reversers caused the brakes to overheat during the landing roll.

Other:

1. The emergency slide rope by the main forward entrance was heavily wound with tape. The unwinding of the tape delayed the evacuation of three of the four crew members.

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JETSTREAM INC.
CESSNA 310L N3074T
LAKE ERIE, ONTARIO
15 mi NE of POINT PELEE
20 JULY 1987

REPORT NUMBER: 87-O/70903

	Pilot-In-Command
Pilot Licence	Commercial (U. S. A.)
Medical Expiry Date	October 1987
Total Flying Time	2000 hr
Total on Type	300 hr
Total Last 90 Days	150 hr

Injuries:	Crew	Passengers	Others	Total
Fatal	1	-	-	1
Serious	-	-	-	-
Minor/None	-	-	-	-
Total	1	-	-	1

HISTORY OF THE FLIGHT:

On the evening of 20 July 1987, a twin-engined Cessna 310L, American registration N3074T, left Montreal/Dorval International Airport, Québec on an instrument flight rules (IFR) flight to Detroit City Airport, Michigan. The charter pilot had delivered her cargo to Dorval, arriving about 1750 eastern daylight time (EDT), and had departed empty for the return flight at 1939 EDT.

The aircraft was cleared as flight-planned via radar vectors to intercept the Victor 316 (V316) low-level airway to the Ottawa very high frequency omnidirectional range (VOR), then V300 to the Kleinburg VOR; V308 to the London VOR; and V98 to the Marje intersection direct Detroit City at 6,000 feet above sea level (asl). The estimated time en route was filed as 2 hours and 40 minutes, with 4 hours and 30 minutes of fuel aboard.

At 2130:56 EDT, Toronto Terminal Control cleared the aircraft direct to London with a hand-off to Toronto Centre. Soon after, Toronto Centre reported to the aircraft that there was some weather ahead starting about 15 miles north of London, with a northeast line towards Windsor. Toronto Centre advised the pilot that she may have to deviate south of London by 50 or 60 miles toward Cleveland, then back and around toward Detroit City. At 2148:39 EDT, Toronto Centre advised the pilot that Cleveland was reporting some severe weather southwest of London and into the Detroit area. The pilot requested a 20-degree deviation to the south which Toronto Centre approved. At 2159:30 EDT, the aircraft was west of London as it was handed off to Cleveland Centre.

At 2203:13 EDT, Cleveland Centre reported the weather conditions ahead and advised the pilot to turn to a heading of 230 degrees. At 2211:28 EDT, the aircraft was over Lake Erie when it was cleared direct to Windsor; however, the pilot requested to fly a heading of 250 degrees for another 10 miles. About 15 minutes later, while still over the Lake Erie (near the northern shoreline), the pilot advised that she was proceeding direct to the Windsor VOR. The controller cleared the aircraft to 5,000 feet asl. About five minutes later, the pilot advised she was deviating south again. At 2231:57, the controller noticed the aircraft's loss of altitude, and, several seconds later, the pilot reported that the aircraft had just flown through a thunderstorm. At 2233:17, the pilot reported that the aircraft was climbing back to 5,000 feet asl from 4,000 feet asl and, soon after, told the controller to stand by after she had asked if the aircraft was now proceeding direct to the Windsor VOR.

This was the last radio transmission received from the pilot, and, at 2234:54 EDT, Cleveland Centre lost radar contact with the aircraft, when it was approximately 15 miles northeast of Point Pelee.

Early the next morning, a small amount of floating wreckage was recovered from Lake Erie and identified as coming from the missing aircraft. The accident occurred during the hours of darkness at about lat 42°02'N, long 82°19'W*, over Lake Erie, Ontario.

PERTINENT INFORMATION:

The investigation revealed that it was the normal practice for the company's pilots to consult with professional aviation weather briefing agencies prior to flight departures. There was no evidence found to indicate that the pilot had requested or received any up-date information on the current weather conditions prior to her departure from the Montreal area for Detroit City that evening. However, the pilot could have received weather information from a source where no records are kept, that is, by telephone or self-briefing. It appears that weather information was not requested by the pilot from flight service stations during the flight between Montreal, Toronto, and London.

The Cleveland Air Route Traffic Control Centre called the Toronto Centre and inquired about the intentions of the pilot of N3074T because, earlier, another aircraft en route to the Detroit area returned to Kitchener, Ontario because of adverse weather. Cleveland Centre advised Toronto Centre to tell the pilot that severe weather conditions existed in the Detroit area. When the radar handoff occurred from Toronto Centre to Cleveland Centre 11 minutes later, the pilot had been alerted to the existing conditions ahead on her flight route.

The last radar target return of the aircraft on the Cleveland radar scope was at 2333:08 EDT. This return indicated that the aircraft was at 4,400 feet asl. The lowest altitude the aircraft reached according to radar analysis was 3,200 feet asl at 2331:38 EDT. From the start of the radar plot, which commenced as the aircraft was deviating south of V98 over Lake Erie (just west of the Alymer VOR) to the last plot (near Point Pelee), the aircraft covered a distance of 65. 8 miles in a time of 24 minutes with an average speed of 164 knots.

ANALYSIS:

The pilot departed from Montreal for Detroit and, while en route, the aircraft crashed into Lake Erie after flying into an area of thunderstorms. The analysis will focus on the weather- and flight-planning-related parts of the occurrence.

There was no evidence of the pilot having received a normal weather briefing prior to her departure from Montreal, or while she was en route, but she may have received weather information from other sources.

When the pilot encountered the thunderstorms, she had to rely on the controllers' information and her own visual cues to avoid the thunderstorms, because her aircraft was not equipped with radar. It was concluded that the aircraft entered an area of thunderstorms, or a thunderstorm, where the turbulence was so severe that the pilot could not maintain control of the aircraft, or which caused the aircraft to break up in flight. It was not possible to determine, from the small amount of wreckage found, whether the aircraft broke up in flight or on contact with the water.

CONCLUSIONS:

Findings:

1. The IFR route selected by the pilot from Montreal/Dorval Airport to Detroit City Airport went through an area of severe thunderstorm activity over western Lake Erie.

2. It could not be determined whether the pilot had obtained a weather briefing prior to the departure from Montreal or during the flight.

3. The pilot continued the flight after being informed by air traffic control that she may have to deviate around severe weather conditions ahead of her.

4. Radard contact was suddenly lost while the aircraft was still at altitude, indicating that the aircraft descended vertically.

5. Although the main aircraft wreckage was not found, the damage to the recovered parts was consistent with water impact damage.

6. It could not be determined whether the aircraft broke up in flight, or if aircraft control was lost because of other reasons.

7. The aircraft was not equipped with weather radar, nor was it required by regulations.

8. The pilot was licensed and qualified to conduct the flight in accordance with existing regulations.

9. The aircraft was certified, equipped, and maintained in accordance with existing regulations.

10. There was no evidence of fire before or after the occurrence.

11. The weight and centre of gravity were within the prescribed limits.

Causes:
The aircraft crashed in an area of severe thunderstorms.

SAFETY ACTION:

The Board has no safety recommendations to issue at this time.

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AQUILA AIR LTD.
CESSNA 172K SKYHAWK C-FXNV
18 mi N of PORT HARDY (B. C.)
JULY 22 1987

OCCURENCE NUMBER: 87-P70053 (Accident)
LOCAL TIME: 1518 PDT
OPERATION: charter airline
DAMAGE: Substantial
PILOT LICENCE: Professionnal

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL:	340	320
LAST 90 DAYS:	124	124

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot departed Bella Bella, British Columbia for a visual flight rules (VFR) flight to Port Hardy. Eighteen miles north of Port Hardy, after 40 to 45 minutes of flight, the aircraft's engine stopped because of fuel exhaustion. The pilot force-landed in a clearing, and the aircraft was substantially damaged.

The aircraft's fuel tanks were filled to capacity the day before the accident and the aircraft's flight endurance was 5 hours and 30 minutes. The aircraft was flown for one hour the evening before the accident and for 3 hours 15 minutes on the day of the accident for a total flight time of 4 hours 15 minutes. Fuel may have been stolen from the fuel tanks the night before the accident.

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PIPER PA-15 VAGABOND C-FRWG
BURWASH LAKE, ONTARIO
20 FEBRUARY 1987

BRIEF NUMBER: 87-O/70010 (Accident)
LOCAL TIME: 1415 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	700	14
LAST 90 DAYS	8	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft was not equipped with an electric starter. The pilot set the throttle, turned the magnetos on, and then commenced to hand-start the engine. The engine started, and the aircraft began to move; the pilot was unable to get into the aircraft to stop it, and the aircraft taxied unoccupied across the frozen bay and struck a tree on the opposite shore.

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CESSNA 152 C-GQDE
TISDALE, SASKATCHEWAN 9 mi N
21 FEBRUARY 1987

REPORT NUMBER: 87-C70006 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1445 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	161	72
LAST 90 DAYS	1	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot and passenger casually made arrangements for a recreational flight in the local area. After take-off, the pilot flew northeast for about 18 nautical miles, then turned to the west. At this time, the pilot saw a snow storm ahead and decided to return to Tisdale for landing. While en route at 1,000 feet above the ground, the pilot encountered a snow shower and descended to near tree-top level. He was following a road leading to the airport, and, because forward visibility was poor, he was looking out the side window. The aircraft struck a power line and crashed. The pilot sustained serious injuries, and the passenger received fatal injuries.

PERTINENT INFORMATION:

The pilot confirmed that the aircraft was in a serviceable condition. He did not request or receive weather information prior to the flight, but he judged the weather to be reasonable. Witnesses in the immediate area reported that the visibility was one-quarter mile in a snow shower at the time of the accident.

The nose landing gear struck the power line which was approximately 50 feet above the road.

The aircraft was equipped with seat lap-belts and shoulder straps. To be used, the shoulder strap must be connected to a stud on the lap-belt buckle. Neither occupant used the shoulder strap. The pilot assisted the passenger in tightening the lap- belt and believes it was not loose. The passenger's lap-belt webbing broke during impact. This belt (P/N 52275 2-4) has a rated strength of 1,500 pounds. Laboratory tests of the failed webbing were conducted, and the belt held until 3,300 pounds of pull were applied, a value well in excess of the requirement. It was determined that the seat-belt had failed in tensile overload. The cause of the overload could not be determined; however, a loose lap-belt and the unconnected shoulder harness may have contributed to the shock loading.

ANALYSIS:

The pilot did not receive weather information prior to take-off and was unaware of current and forecast conditions. When the forecast reduced visibility in snow was encountered, the pilot attempted to maintain visual contact with the ground. This required flying at very low altitude and resulted in the nose landing gear striking the power line and the subsequent loss of control.

The passenger's seat-belt failed as the stress limits were exceeded. Had the shoulder harness been used, the shock load applied to the lap-belt may have been reduced.

FINDINGS:

Cause Related:
1. The aircraft struck a power line while the pilot was attempting to maintain visual flight in reduced visibility.

Other:
1. Neither occupant was wearing the available shoulder straps.

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CESSNA 170B C-FGZS
AIRDRIE, ALBERTA
22 FEBRUARY 1987

REPORT NUMBER: 87-W70013 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1320 MST
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,200	2
LAST 90 DAYS	30	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on a ferry flight from Airdrie to Jasper, Alberta. During the initial take-off run, the pilot's door opened, and while the pilot was closing the door, the aircraft fish-tailed down the runway in a three-point attitude. After about three heading excursions, the aircraft became airborne at a low airspeed; it then stalled, and the left wing struck the runway. The aircraft swerved to the left, ran onto the grass, and the right main landing gear tore free. The aircraft settled onto its right wing and left gear.

Witnesses stated that, during the take-off run, the tail wheel was not lifted, and the aircraft became airborne in a three-point attitude. Prior to the take-off attempt, the pilot was given a circuit check-out by another private pilot and was assessed as capable of flying an aircraft equipped with conventional landing gear. As the pilot's experience was mainly on aircraft with tricycle landing gear, the need to raise the tail during the take-off run and to wait until flying speed was reached before lifting off was discussed. The pilot felt he had achieved flying speed, and, because of the control difficulties he was experiencing, he attempted to lift the aircraft off the runway by applying aft pressure on the control wheel.

The pilot's door had not been closed properly. When the door opened, the pilot elected to close it while continuing with the take-off, and, because of the distraction, he lost directional control. The pilot attempted to lift the aircraft off in a three-point attitude, and, as a result, the aircraft became airborne at a low airspeed and stalled. During the take-off run, the pilot did not release the back pressure on the control wheel, as demonstrated during the check-out, thus causing the tail wheel to remain on the runway until lift-off.

FINDINGS:

Cause Related:

1. A door opening diverted the pilot's attention from his flight duties, and he lost directional control of the aircraft.

2. The pilot did not raise the tail during the take-off run, with the result that the aircraft became airborne at too low a speed, and it stalled.

Other:

-Nil-

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PIPER PA-20 PACER CF-XXO
CAMBRIDGE BAY, NORTHWEST TERRITORIES
22 FEBRUARY 1987

REPORT NUMBER: 87-C70007 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1700 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	450	375
LAST 90 DAYS	9	9

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

After landing on an ice strip, the left ski of the aircraft struck a snow-drift, causing the left main landing gear assembly to fail.

An examination of the parts showed that the assembly had failed in the area of the shock strut attachment cluster. At this point, two tubular members and a tubular strap come together to form a cluster and bolt fitting to attach to a shock strut/bungee unit. The welds on this unit had failed, and the welding was of substandard quality. It could not be determined who had performed the welding.

The welds failed when the ski struck the snow-drift. This allowed the tubular strap to pull free from the attachment cluster, and the left landing gear moved laterally away from the side of the aircraft. When this occurred, the gear leg could no longer support the weight of the aircraft.

FINDINGS:

Cause Related:

1. The landing area was not free of obstacles.

2. The left main landing gear assembly failed when the ski struck a snow-drift.

3. The welding carried out on the shock strut/bungee unit was of substandard quality.

Other:

-Nil-

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PA-30 TWIN COMANCHE C-FIXL
LANGLEY, BRITISH COLUMBIA
26 FEBRUARY 1987

REPORT NUMBER: 87-P70008 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1314 PST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,600	600
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was attempting to land on the button of a 1,900-foot runway. While on short final, with the landing gear and the flaps fully extended, the pilot quickly added power to both engines to bring the aircraft onto the runway. The left engine was slow to respond, and the high rate of descent was not arrested. The aircraft landed hard in soft ground 30 feet short of the runway, and the left main gear was torn off. The aircraft skidded to a stop near the control tower, narrowly missing a parked aircraft.

On short final, the pilot established a high rate of descent in an effort to land on the button of the runway. The left propeller struck the ground on two separate occasions during the runway excursion. The evenly spaced ground scars and damage to the propeller indicated that power was being developed by the engine at the time of ground contact.

The weather is not considered to be a factor in this accident. Because the pilot misjudged the approach and was unable to arrest the aircraft's rate of descent due to the engine's slow response to power application, the aircraft landed hard short of the runway.

FINDINGS:

Cause Related:
1. Because the pilot misjudged his approach, and the left engine was slow in responding to the power increase, the aircraft landed hard short of the runway.

Other:
-Nil-

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MAULE M4 220C C-FQGC
WILLISTON LAKE, BRITISH COLUMBIA
06 MARCH 1987

BRIEF NUMBER: 87-P70011 (Accident)
LOCAL TIME: 1415 PST
OPERATION: Private Other
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

While en route on a visual flight, the pilot encountered light snow which rapidly changed to a whiteout condition as he flew over a large snow-covered lake. Following the loss of all visual reference with the ground, the pilot decided to land straight ahead. The aircraft touched down on the lake surface in a slight nose-down attitude at 90 to 100 mph, with flaps and wheel-skis in the up position and nosed over.

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CHAMPION 7EC C-FNMR
GODERICH, ONTARIO
07 MARCH 1987

REPORT NUMBER: 87-O/70016 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0940 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	273	230
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot of the tail-wheel-equipped aircraft was on a visual flight rules (VFR) flight from Centralia to Goderich, Ontario. Shortly after touchdown, the aircraft veered to the right and went off runway 28 onto a ploughed field. The main landing gear collapsed, and the aircraft skidded to a stop.

While en route, the pilot contacted the UNICOM station at Goderich and received traffic and weather information. The wind was 187 degrees magnetic at 15 miles per hour. The pilot, aware that the wind was from his left side, compensated by side-slipping on final approach. When the main gear touched down, directional control was lost before the tail wheel made contact with the runway. The aircraft then swung to the right and ran off the right side of the runway onto a ploughed field, causing the main landing gear to collapse in overload.

FINDINGS:

Cause Related:
1. The pilot lost directional control of the aircraft during the cross-wind landing.

2. The aircraft ran off the runway onto a ploughed field, where the main landing gear collapsed in overload.

Other:
-Nil-

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CESSNA A185F SKYWAGON C-GQNY
BOBCAYGEON, ONTARIO
08 MARCH 1987

REPORT NUMBER: 87-O70017 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1730 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	800	300
LAST 90 DAYS	16	16

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was backtracking along the 23-by-1,350-foot ploughed airstrip for take-off from the end. The pilot had taxied approximately 500 feet when the left wheel entered a soft spot in the snow-covered surface of the strip, and the aircraft swung to the left. The pilot applied power to correct the swing. The aircraft continued to swing even more to the left, and it struck a 30-inch-high snowbank which ran the length of the runway. The propeller, engine mounts, and right outer wing were damaged.

The pilot had landed successfully on the strip earlier in the day. He reported that, at that time, the runway surface was frozen and hard. During the course of the day, the temperature had risen above freezing, and the surface had become soft and slushy.

FINDINGS:

Cause Related:
1. During taxi for take-off, the left wheel entered a soft spot in the snow-covered runway, causing the aircraft to swing to the left.

2. The pilot applied power to correct the swing, causing the aircraft to swing even more, until it struck a snowbank on the side of the narrow runway.

Other:
-Nil-

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BEECHCRAFT D35 BONANZA C-GYDR
BOUNDARY BAY AIRPORT, BRITISH COLUMBIA
08 MARCH 1987

REPORT NUMBER: 87-P70010 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1340 PST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	160	80
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

On completion of a local visual flight rules (VFR) flight, the pilot returned for a landing. The approach was a little steeper and faster than normal, and the aircraft bounced several times after touchdown. The pilot reported that, during the landing roll, he retracted the flaps, and then the nose and left landing gear collapsed. The aircraft came to a stop on the runway with the flaps down. The pilot and his passenger evacuated without injury.

Examination of the landing gear did not reveal any failures that could have contributed to the accident. The landing gear safety switch, a switch designed to prevent the gear from retracting when there is weight on the right landing gear oleo, functioned normally when checked.

The National Transportation Safety Board (NTSB), concerned with the number of inadvertent landing gear retractions on Beech Bonanzas, conducted a study into the problem and issued a report in 1980 (Report number NTSB-SR-80-1). This study reviewed all inadvertent gear retractions that occurred between 1975 and 1978. The Bonanzas comprised only 30 per cent of the single-engine fleet with retractable gear but had had 67 per cent or 16 of the 24 accidents that occurred in this time period. These accidents occurred when the the pilots involved attempted to retract the flaps after landing. Examination of the cockpit revealed four design deficiencies with regard to the landing gear and flap controls which could lead to design-induced pilot error. The deficiencies were as follows:

1. a lack of adequate "shape coding" of the landing gear and flap controls to permit the pilot to differentiate between them on the basis of feel alone;

2. an arrangement of these two controls in non-standard locations, increasing the probability that the pilot will actuate one control while intending to actuate the other;

3. the horizontal bar on which the control wheels are mounted is positioned so that it obscures the pilot's view and obstructs his reach of these two controls; and

4. the lack of a guard or latch to prevent the pilot from activating this control unless the guard/latch is moved first.

The NTSB report concludes with the recommendations that on new Bonanzas the flap and gear levers should be relocated, the levers should be shaped to indicate their function, and the landing gear switch should have a guard. It is also recommended that existing aircraft be modified to include a landing gear latch or guard and a wheel-shaped switch.

All these deficiencies were present in this aircraft, a 1953 model, except that the landing gear lever was wheel shaped.

Given the history of inadvertent gear retractions on this type of aircraft, the flap position at the accident scene, and no apparent failure of the gear mechanism, it is most likely that the pilot inadvertently retracted the gear while attempting to raise the flaps during the landing roll. The landing gear safety switch would not have prevented the gear from retracting if the right oleo was extended when the gear up selection was made. This condition would have existed when the aircraft bounced back into the air after touchdown.

FINDINGS:

Cause Related:
1. The pilot inadvertently retracted the landing gear while attempting to raise the flaps during the landing.

Other:
-Nil-

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CESSNA 185 SKYWAGON C-FFVS
GATINEAU AIRPORT, QUÉBEC
10 MARCH 1987

BRIEF NUMBER: 87-Q70004 (Accident)
LOCAL TIME: 1220 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	300	85
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was landing on runway 27 in a cross-wind of about seven knots from the north. During the landing roll, the wind suddenly increased in intensity, and the aircraft began to skid. The pilot tried to correct the situation, and the right wing lifted. The left wing tip scraped the runway for a distance of 100 feet. The pilot manoeuvred the aircraft in an attempt to maintain the runway centre line, and, at the end of the run, the aircraft somersaulted and came to a stop on its back.

The Canada Flight Supplement issued by Transport Canada warns pilots of possible turbulence during approach to runway 27 when the winds are from the north.

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PIPER PA-28-R-180 CHEROKEE ARROW
C-FQQZ
BRAMPTON AIRPORT, ONTARIO
16 MARCH 1987

REPORT NUMBER: 87-O/74058 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1520 EST
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	272	170
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

On approach to the Brampton Airport, the pilot selected the landing gear down. The landing gear extended, but the green gear-down light for the right main landing gear did not illuminate. The pilot recycled the landing gear and determined that the indicator light was serviceable. The landing gear would retract and extend, but the light would not indicate that the right landing gear was down and locked. Attempts to obtain a down-and-locked indication by use of the emergency extension system was also unsuccessful. Prior to touchdown, the pilot shut down the engine, and, as the aircraft settled onto the runway, the right main landing gear collapsed. The aircraft swung to the right onto the grass beside the runway.

The landing gear is operated hydraulically by an electrically driven hydraulic pump. The emergency system consists of a hydraulic bypass valve which relieves the hydraulic pressure on the landing gear actuating cylinders and allows the landing gear to fall freely to the down position. Main gear downlock springs on the landing gear side brace arms pull the side braces to an overcentre position when the gear is fully extended, and this locks the gear in the down position.

The landing gear pivot points were stiff because of a lack of lubrication. The aircraft had been inspected and lubricated about seven months prior to the incident; it had flown only 10 hours since that time and had been stored outside over the winter. Lubrication of the landing gear resulted in normal operation of the landing gear extension system.

The approved maintenance schedule requires that the landing gear be lubricated during the 100-hour inspection. This occurs only once a year on aircraft with low utilization and does not consider the effect on the lubricant of long periods of outdoor storage. Piper Service Letter SL684 was issued to warn of the possibility of unsatisfactory operation of the landing gear because of the lack of lubrication, but this service letter applied only to aircraft which had less than 100 hours since new and which may not have been properly lubricated at the time of initial assembly.

The emergency extension valve was found to be leaking and bypassing fluid internally.

After the landing gear was lubricated, it fell freely to the down-and-locked position, and the gear down lights illuminated. The failure of the emergency extension system was due to the lack of lubrication.

The internal leak in the emergency extension valve allowed hydraulic fluid to bypass through that valve and prevented a sufficient amount of pressure from developing during the extension cycle. Had the hydraulic system pressure increased to the rated pressure, the gear would have been forced to the down position when the normal gear extension system was used.

FINDINGS:

Cause Related:

1. The landing gear pivot points were stiff due to a lack of lubrication.

2. The internal leakage in the emergency extension valve prevented the hydraulic pressure from increasing to a sufficient pressure to overcome the stiffness in the pivot points and move the gear to the fully down position during normal extension.

3. The attempt to extend the gear by the emergency system was unsuccessful because the stiff pivot points did not allow the gear to fall freely.

Other:

-Nil-

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CESSNA 150L C-GTLF
PETAWAWA, ONTARIO
21 MARCH 1987

REPORT NUMBER: 87-O/70019 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1015 EST
OPERATION: Private Training
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:

	PILOT-IN-COMMAND (STUDENT)		INSTRUCTOR	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	182	182	8,500	600
LAST 90 DAYS	9	9	200	190

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The private pilot and the instructor were departing on a training flight to practise forced approaches. Just after take-off, while at about 600 feet above ground level, the instructor retarded the throttle to simulate an engine failure. A turn was attempted to return to the airport, and a rapid loss of altitude occurred. Power was applied, the wings were levelled, and the nose was raised in an attempt to stop the descent. The aircraft continued to descend, and the tail of the aircraft struck trees. The aircraft then crashed into the trees.

The instructor did not brief the student on the forced-approach procedure, before the flight. Prior to the engine-failure exercise, the pilots did not establish who was going to be flying the aircraft.

As there was no suitable landing area ahead of the aircraft when the engine failure was simulated, a high rate of turn was used in the attempt to return to the airport. This resulted in a rapid loss of altitude. The exercise was not abandoned, and the recovery was not started soon enough to prevent the aircraft from descending and striking the trees.

FINDINGS:

Cause Related:

1. The recovery from the simulated forced approach was not started soon enough to prevent the aircraft from striking obstructions on the ground.

2. Prior to the engine-failure exercise, the pilots did not establish who was going to be flying the aircraft.

3. The instructor did not brief the student on the forced-approach procedure before the flight.

4. The instructor did not select a suitable area for landing before simulating the engine failure.

Other:
-Nil-

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CESSNA 177B CARDINAL CF-TDW
STROME, ALBERTA 3 mi SE
22 MARCH 1987

REPORT NUMBER: 87-W70015 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1200 MST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	1,500
LAST 90 DAYS	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and one passenger departed Camrose, Alberta on a visual flight rules (VFR) flight to Olds, Alberta. Once airborne, the pilot flew over a friend's farm near Daysland, then headed in a southerly direction toward Olds. He encountered a whiteout condition and attempted to maintain visual contact with the ground. He descended, and the aircraft struck a snow-covered field and nosed over.

The weather in the area from Camrose to Olds was below VFR limits. Coronation, a weather station 50 miles east of the intended track, had issued three special weather reports indicating partially obscured conditions, overcast ceiling of 200 feet, and visibility reduced in light snow showers. These reports were issued within the hour preceding the accident.

The pilot, who was not qualified or experienced in instrument flying, did not obtain a weather briefing prior to departure. When he encountered the adverse weather, he made no attempt to return to the departure point, rather he attempted to maintain visual contact with the ground by descending. Because of the whiteout conditions and poor visibility, the pilot inadvertently flew the aircraft into the ground.

FINDINGS:

Cause Related:
1. The pilot continued flight into adverse weather conditions.

Other:
-Nil-

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PIPER PA-28-140 CHEROKEE C-GXAY
RADISSON, SASKATCHEWAN
03 APRIL 1987

BRIEF NUMBER: 87-C70030 (Accident)
LOCAL TIME: 1425 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	225	218
LAST 90 DAYS	16	16

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was taking off from a 2,400-foot farm strip. After about 300 feet of take-off run, the aircraft ran through a soft spot, and the speed was reduced momentarily. The take-off was continued, but, shortly thereafter, the pilot realized that the aircraft was not going to become airborne prior to reaching a puddle of water located 900 feet from the far end of the strip. He veered to the right off the strip with the intention of rejecting the take-off in the adjacent grain field. As the aircraft approached another puddle, the pilot pulled the aircraft into the air to clear the puddle. The aircraft stalled, and the nosewheel contacted the soft ground. The nose oleo strut failed at impact.

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CESSNA 180B SKYWAGON C-FLRJ
PITT MEADOWS, BRITISH COLUMBIA
04 APRIL 1987

BRIEF NUMBER: 87-P70013 (Accident)
LOCAL TIME: 1508 PST
OPERATION: Private
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	215	34
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot had recently bought the tail-wheel-equipped aircraft and set out to practise circuits on runway 26 left. On the first touchdown, the aircraft swung right, and the pilot was unable to regain control. The aircraft slid sideways down the runway, and the left landing gear collapsed. The wind was from 330 degrees at three to five knots.

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CESSNA 180 SKYWAGON C-GBSE
DAWSON CREEK, BRITISH COLUMBIA 3 mi W
05 APRIL 1987

BRIEF NUMBER: 87-W70017 (Accident)
LOCAL TIME: 1600 MST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	350
LAST 90 DAYS	11	11

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

In preparation for a local flight, the pilot fuelled the aircraft from a drum using a wire mesh screen and funnel. The aircraft fuel sumps were not drained prior to departure. About 10 minutes after take-off, the engine (Continental O-470-L) lost all power. A forced landing was carried out on a cultivated field, and, as the aircraft slowed, the landing gear dug into the soft ground. The aircraft nosed down, causing substantial damage to the aircraft; however, the occupants were uninjured. The pilot drained the fuel strainer bowl and discovered that it was full of water.

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CESSNA 180 SKYWAGON C-FSGQ
GODS LAKE, ALBERTA
05 APRIL 1987

REPORT NUMBER: 87-W70018 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1600 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	569	480
LAST 90 DAYS	68	68

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

As the wheel/ski-equipped aircraft touched down on the frozen lake, the left main gear collapsed, followed shortly by the collapse of the right main gear.

The pilot reported a normal landing and indicated that the ice surface was suitable for use as a landing area.

Examination of sections of the left-hand landing gear support bracket by the CASB Engineering Laboratory indicated that fatigue cracks had progressed through 70 per cent of the cross-sectioned area prior to failure in overload. The right-hand support bracket showed areas of fatigue cracking; however, it failed primarily as a result of overload. The surface of the leg slots in both the support brackets and the retaining wedges showed evidence of wear and pounding which indicates excessive relative movement of the legs and/or wedges in service. The primary cause of this excessive movement was improper shim application during installation of the gear legs.

FINDINGS:

Cause Related:
1. The landing gear support brackets had fatigue cracks as a result of improper shim application during installation of the gear legs.

2. Overload during the landing caused the fatigue-cracked landing gear support brackets to fail.

Other:
-Nil-

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CESSNA 177 RG CARDINAL C-FCZN
SASKATOON, SASKATCHEWAN
06 APRIL 1987

REPORT NUMBER: 87-C70014 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 2120 CST
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	187	65
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was conducting solo night circuits to accumulate the required time and experience for a night endorsement. After approximately two hours of circuits the pilot inadvertently landed the aircraft wheels-up.

The pilot did not complete a pre-landing check, although a check-list was available to him, and did not select the landing gear lever to the down position.

The gear warning horn system was unserviceable; this condition had existed for some time, and the pilot was aware of this unserviceability.

The pilot was completing the ninth circuit when the accident occurred. The first five circuits were controlled by an air traffic controller who included the "check gear down" reminder with the landing clearances. Another air traffic controller assumed tower duties after the fifth circuit, but the reminder to check the gear down was not included in his transmissions.

The pilot's pre-landing check was incomplete and the landing gear was not lowered. A contributing factor to this accident was an unserviceable landing gear warning system, although the pilot was aware of this unserviceability. The pilot may have become fatigued by flying solo circuits at night for almost two hours, thus reducing his ability to concentrate and causing him to omit lowering the gear.

FINDINGS:

Cause Related:
1. The pilot did not complete the pre-landing check, and the landing gear was not lowered.

2. The landing gear warning horn was unserviceable, and the pilot was aware of this situation.

3. The reminder to check that the landing gear was down was not included in the landing clearance.

Other:
-Nil-

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PIPER PA-22-135 TRI PACER C-GKMK
VICTORIA INTERNATIONAL AIRPORT, BRITISH COLUMBIA
19 APRIL 1987

REPORT NUMBER: 87-P70015 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1435 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,000	300
LAST 90 DAYS	14	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and the owner of the Piper PA-22 Tri Pacer had been practising circuits and landings in the aircraft on runway 13 at Victoria International Airport. On short final approach for the third landing, the aircraft nosed up slightly and then entered a gentle descending turn to the left. The pilot applied right aileron, right rudder, up elevator, and power, but the aircraft remained in the turn until it flew into the ground off to the side of the runway. The left wing was damaged, and the nosewheel was bent backwards under the aircraft as it skidded to a stop. Neither the pilot nor the passenger was injured; the aircraft was not equipped with shoulder harnesses.

Scattered clouds, unrestricted visibility, and winds from 140 degrees magnetic at 11 knots were recorded at the time of the accident. The automatic terminal information service (ATIS) reported the winds to be from 120 degrees at 10 to 15 knots and occasionally up to 20 knots.

The aircraft's flight controls were examined after the accident and were found to be operational. The weight and balance were calculated to have been within allowable limits.

According to the owner's handbook, the full-flap stalling speed of the Tri Pacer is 49 mph. The pilot reported that the accident aircraft, with its modified wing tips, stalled at a speed about four mph lower. The recommended approach speed with full flaps extended is 75 to 80 mph and the landing speed is 50 to 60 mph. On the approach, the pilot was maintaining an airspeed of 60 mph and had 10 degrees of flaps selected.

A 60-mph approach speed with 10 degrees flap selected is 15 to 20 mph below the recommended full-flap approach speed. The stall speed with 10 degrees of flap was not determined, but, at 60 mph, the aircraft would have been flying close to the stall; a sudden decrease in airspeed due to the gusty winds and turbulence caused the aircraft to stall. The pilot's control and power inputs were incorrect to effect a recovery, and the aircraft continued to descend, out of control, until it struck the ground.

FINDINGS:

Cause Related:
1. The pilot flew the approach at a speed below the recommended approach speed and close to the stall speed.

2. The aircraft stalled when it encountered turbulence and gusty, variable winds.

3. The pilot used an incorrect stall recovery technique.

Other:
-Nil-

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AERO COMMANDER 100-150 DARTER CF-TKT
MOOSE LAKE, BRITISH COLUMBIA
14 APRIL 1987

BRIEF NUMBER: 87-P70016 (Accident)
LOCAL TIME: 1030 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,600	840
LAST 90 DAYS	25	25

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot, with 200 pounds of cargo on board, was attempting a take-off from Moose Lake, a private airstrip in central British Columbia, approximately 50 miles north of Anahim Lake. The runway was 3,200 feet above sea level and about 3,000 feet long. The first 2,300 feet of the runway had been cleared of snow, and this area was wet and soft. The wind was reported as variable up to 30 mph at 35 degrees off the runway heading, and there was a downdraft as the wind came over trees at the edge of the runway. Because of the soft surface, the pilot pulled the aircraft into the air in a nose-high attitude. Once airborne, the aircraft was unable to accelerate and climb out of ground effect because of the downdraft and excess drag caused by the nose-high attitude. As the end of the cleared portion of the runway was approaching, the pilot reduced the power and ran into the deep snow at the end of the runway. The aircraft overturned and was substantially damaged.

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CESSNA 172N SKYHAWK C-GIXH
CARAMAT, ONTARIO
15 APRIL 1987

BRIEF NUMBER: 87-O70024 (Accident)
LOCAL TIME: 1810 EDT
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	625	400
LAST 90 DAYS	85	25

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

While en route from Thunder Bay to Chapleau, Ontario, the pilot encountered deteriorating weather, and he carried out an uneventful precautionary landing on an abandoned road at Caramat.

When the pilot noticed an improvement in the weather, he decided to continue the flight. During the take-off attempt, the aircraft left main landing gear wheel entered soft ground along the edge of the roadway, causing the aircraft to decelerate, and preventing it from becoming airborne. The aircraft struck two posts at the end of the road and was substantially damaged.

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PIPER PA-23-160 APACHE C-FTBZ
ST. ADOLPHE AIRPORT, MANITOBA 1 mi NE
17 APRIL 1987

REPORT NUMBER: 87-C70015 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1100 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,271	60
LAST 90 DAYS	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft had just become airborne when the right engine lost complete power. The pilot attempted a forced landing onto a field to the right of his departure path. While in the turn, the aircraft struck a ditch, bounced onto a grid road, and came to rest with the right main gear collapsed.

The aircraft had been in storage for the winter, and this was the pilot's first flight of the year. The fuel tanks were visually examined during the hurried external check. The auxiliary fuel tanks were selected for take-off rather than the main tanks as is recommended by the manufacturer. The main tanks were full, but the auxiliary tanks were virtually empty.

The power loss occurred when the aircraft was at an altitude of 60 feet above ground level and at an airspeed of 85 miles per hour, which is the critical single-engine control speed for this aircraft. At this point, the pilot decided to land rather than attempt to remain airborne. The right propeller was not feathered, and the landing gear was not raised. For landing, the pilot selected a field 90 degrees to the direction of take-off to avoid a water-soaked field straight ahead.

The engine lost power because of fuel starvation caused by improper fuel tank selection. The power loss occurred at a critical airspeed and altitude, and the pilot decided to land immediately.

FINDINGS:

Cause Related:

1. The right engine lost power because of fuel starvation caused by improper fuel tank selection.

2. The power loss occurred at a critical stage of flight, prompting the pilot to land immediately.

Other:

-Nil-

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AVIATION OCCURRENCE REPORT
BEECHCRAFT 23 MUSKATEER C-GHAY
MANNING PARK, EAST GATE,
BRITISH COLUMBIA
17 APRIL 1987

REPORT NUMBER: 87-P70018 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1530 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,000	796
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The intended pleasure flight from Pitt Meadows, British Columbia (B.C.) to Vernon, B.C. was to be conducted under VFR. Since the pilot had received conflicting reports on the weather in the Hope, B. C. area, he decided to fly to Hope and then make the decision on whether to continue the flight. The aircraft departed Pitt Meadows, at 1444 Pacific daylight time (PDT) and was declared overdue at 1739 PDT. A search and rescue (SAR) overflight was conducted, and, at 2115 PDT, a weak emergency locator transmitter (ELT) signal was received in the Copper Creek valley just north of Manning Park's East Gate. The ELT position was confirmed, but darkness and bad weather precluded any further SAR operation. The following morning, a SAR specialist reached the site and confirmed that the wreckage was the overdue aircraft and that the pilot had received fatal injuries during the accident.

PERTINENT INFORMATION:

The pilot had both aviation forecasts and hourly reports available prior to departure. The forecast indicated that ceilings as low as 500 feet above ground level (agl) and visibilities as low as one-quarter mile could be expected with conditions improving throughout the forecast period. The forecast also indicated the possibility of moderate rime icing in cloud above the freezing level. The hourly reports from Hope and the Hope Slide area both indicated that good VFR conditions existed 45 minutes prior to departure. While the pilot was preparing his aircraft for the flight to Hope, he met another pilot who had just returned from Hope and reported that the weather to the east was not good.

The weather at East Gate, B.C. , one mile south of the crash site, was reported as variable with periods of heavy snow reducing visibility throughout the afternoon of the accident. The pilot was not qualified and had received no training for instrument flying.

The flap selector lever was in the second detent. Since the remaining flap connections were destroyed by fire, flap position could not be confirmed.

Broken tree branches were found on the northeast face of a rounded slope, 540 feet from the wreckage. A helicopter was used to follow the flight path of the aircraft. As the helicopter overflew the broken branches and progressed around the mountain slope onto a southerly heading, tall deadheads extending above the tree-tops forced the helicopter to turn to the right. The right turn positioned the helicopter over the crash site.

There were no known pre-impact deficiencies with the aircraft, nor was there any evidence that incapacitation or physiological factors affected the pilot's performance.

ANALYSIS:

The weather forecast for the intended route indicated marginal but improving weather conditions for the afternoon of 17 April. The pilot decided that he would fly to Hope to check on weather conditions and then decide if he would continue or return. When the pilot arrived at Hope, the weather conditions were scattered clouds with good visibility. These conditions and the knowledge that the weather was improving undoubtedly persuaded the pilot to continue along the Hope-Princeton route. However, by the time the flight reached East Gate, weather conditions were below VFR limits. The pilot likely entered the canyon to the north of the highway either because he was unable to see the highway due to the deteriorating weather or because he was attempting to turn around. The pilot may have decided to reduce the airspeed of the aircraft near the mountainside so that he could maintain visual reference with the ground. The broken branches situated 540 feet from the crash site indicate that the pilot was flying near the tree-tops and inadvertently struck them, possibly in an attempt to remain in visual contact with the ground.

FINDINGS:

Cause Related:
1. The pilot, who was not qualified or trained for instrument continued flight into adverse weather conditions.

Other:
-Nil-

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CESSNA 140 C-FXZQ
NORWOOD, ONTARIO
20 APRIL 1987

REPORT NUMBER: 87-O/70027 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1310 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	69	11
LAST 90 DAYS	15	11

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

After a short cross-country flight, the pilot attempted a full-stop landing at the private aerodrome where he based the aircraft. On touchdown, the aircraft bounced, and the pilot applied full power for a go-around. The pilot then saw that the airspeed was low, and with full flap extended, he felt that he would not be able to clear the trees at the end of the runway, and he closed the throttle. While the aircraft was airborne during the attempted go-around, the aircraft drifted to the right of the runway and touched down on rough ground near the runway edge lights. As the pilot manoeuvred to avoid the lights, the aircraft struck an area of soft ground. The main wheels dug in, and the aircraft nosed over.

FINDINGS:

Cause Related:
1. During an aborted go-around, the aircraft touched down off the edge of the runway.

2. The main landing gear hit soft ground, and the aircraft nosed over.

Other:
-Nil-

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SASKATOON SOARING CLUB INC.
CESSNA 150F C-GQOK
HANLEY, SASKATCHEWAN 2 mi S
26 APRIL 1987

REPORT NUMBER: 87-C70063 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1415 CST
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	418	276
LAST 90 DAYS	1	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The tow plane was returning to the airport following release of a glider. On the downwind leg, the engine lost all power, and the pilot carried out a forced landing in a field. The aircraft rolled into a drainage ditch, and the nose gear assembly collapsed.

The engine (Lycoming 0-320E2D) was examined, and the fuel outlet fitting from the gascolator was found to be broken; the fracture surface showed signs of pre-cracking. Also the number six flex hose fitting had sealing compound on the thread in an effort to stop a small fuel leak. There were fuel stains (red dye) on the gascolator and on the broken surface of the outlet fitting. It was determined that the fracture of the outlet fitting was caused by not holding the fitting while torquing the flex line nut during maintenance. The fractured fitting caused the fuel supply to the engine to be interrupted, resulting in fuel starvation and the subsequent loss of power.

FINDINGS:

Cause Related:
1. The fuel outlet fitting for the gascolator was factured, resulting in fuel starvation and the subsequent loss of engine power.

2. During maintenance, the fuel outlet fitting was improperly installed which caused the fracture of the fitting.

Other:
1. The fuel leak from the flex hose fitting was improperly repaired.

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CESSNA 150L C-GLCH
BARRIE EXECUTIVE AIRPARK, ONTARIO
26 APRIL 1987

REPORT NUMBER: 87-O/70029 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1410 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		TRAINEE	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	11,860	25	15,000	2
LAST 90 DAYS	142	6	121	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

While landing in a 80-degree cross-wind at 10 to 15 knots, with moderate mechanical turbulence, the aircraft bounced and then descended in a nose-low attitude back onto the runway. The nosewheel collapsed, and the aircraft slid to a stop, remaining on the runway.

The trainee was receiving a check-out on the aircraft and was at the controls during the landing. The trainee was a very experienced pilot; however, his experience was primarily on large aircraft, and he had not flown this type of aircraft prior to this flight.

When the aircraft bounced, a nose-up attitude was not maintained, and the aircraft was allowed to descend nose-down. Although the pilot was highly experienced, he was unfamiliar with the handling characteristics of this aircraft during the landing phase in strong cross-winds and turbulence, and he did not maintain the proper landing attitude after the aircraft bounced.

FINDINGS:

Cause Related:
1. The correct landing attitude was not maintained while attempting to land in a strong cross-wind and moderate turbulence.

Other:
-Nil-

BEECHCRAFT J35 BONANZA C-GADT
BIG RIVER, SASKATCHEWAN 12 mi NW
29 APRIL 1987

REPORT NUMBER: 87-C70018 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1130 CST
OPERATION: Private Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	825	285
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot took off from a private strip for a short visual flight rules (VFR) flight to his home airport. During the climb-out, while the aircraft was at an altitude of about 500 feet above ground, the engine (Continental IO-470N, B) lost power. The pilot switched fuel tanks, but the engine did not respond. He force-landed the aircraft, with the landing gear retracted, in an open field, and the aircraft was substantially damaged.

The aircraft had only recently been put back into service after being stored outside for the winter months. The airframe fuel screen was found to be contaminated with rust and dirt. Approximately one half of the screen was completely blocked with rust, and there was about one tablespoon of loose contaminants that closed off the remaining area of the screen. Water had been allowed to remain in the fuel strainer over an extended period of time, causing the retainer spring to rust.

The almost complete blockage of the airframe fuel screen by rust and contaminants resulted in fuel starvation and the subsequent power loss after take-off.

FINDINGS:

Cause Related:
1. Rust and other contaminants blocked the fuel screen, causing the engine to lose power because of fuel starvation.

Other:
-Nil-

CESSNA A185E CF-UIV
BURLINGTON, ONTARIO 5 mi N
06 MAY 1987

REPORT NUMBER: 87-O/70032 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1930 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,600	150
LAST 90 DAYS	50	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot reported he was taxiing along a turf runway on private property, and, while the aircraft was turning to the left, the right main landing gear leg failed.

The runway surface was relatively smooth and approximately 950 feet long and 60 feet wide. The south side of the runway was bordered by trees that were approximately 50 feet high. The aircraft had been moved prior to the arrival of the Canadian Aviation Safety Board investigator, and there were no distinguishable ground marks to indicate where the aircraft had come to rest.

The landing gear outboard support bracket was fractured in two halves, and there was minor skin damage on the aircraft fuselage where the right main gear protrudes through the airframe. The support bracket was found to have failed in overload, indicating that the landing gear had been subjected to loads beyond its design capability. The nature of the damage indicated that the gear leg had folded under the aircraft during the turn in typical ground loop fashion and not as a result of normal taxiing loads.

FINDINGS:

Cause Related:
1. The right-hand landing gear outboard support bracket failed in overload when the aircraft ground looped to the left.

Other:
-Nil-

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BELLANCA 14-19 CRUISE-MASTER C-FGLQ
SASKATOON, SASKATCHEWAN
07 MAY 1987

REPORT NUMBER: 87-C74023 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1910 CST
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	N/A
LAST 90 DAYS	20	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

During the approach to land, when the pilot lowered the landing gear, the indicator for the left main landing gear showed unsafe. The pilot was informed that the left gear was at a 30-degree angle in relation to the normal down-and-locked position, and he elected to land on a grass strip. During the landing roll, the left wing tip contacted the ground, and the aircraft pivoted, coming to rest 90 degrees to the landing direction.

The left landing gear check cable was found broken. The diameter of the cable was 1/16 of an inch; the manufacturer recommends using a cable with a diameter of 3/32 inches. Microscopic examination of the cable showed that it had failed in tensional overload. Scuffing in the wheel well was noted where the tire had jammed. The hydraulic actuator attachment point on the drag strut had also failed.

The aircraft had not flown for a long time, and the Certificate of Airworthiness was not valid.

The check cable is used to partially compress the shock strut during retraction of the landing gear, thereby allowing the wheel to enter the wheel well. The broken cable allowed the tire to jam in the wheel well, and, when the landing gear was selected down, the hydraulic actuator attachment point on the drag strut failed. A full extension of the landing gear leg was not possible, and, when the aircraft touchdown, the landing gear collapsed into the wheel well.

FINDINGS:

Cause Related:

1. A retraction check cable, which was smaller than that recommended by the manufacturer, had failed in tensional overload.

2. The broken check cable allowed the landing gear leg to extend and jam in the wheel well.

3. The left landing gear leg did not fully extend because the hydraulic actuator attachment point had failed.

Other:

1. The Certificate of Airworthiness was not valid.

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LUSCOMBE 8E C-FKSP
BRACEBRIDGE, ONTARIO 1 mi E
10 MAY 1987

REPORT NUMBER: 87-O70035 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1400 EDT
OPERATION: Private
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	57	7
LAST 90 DAYS	7	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot departed Muskoka Airport on a flight to South River, some 55 miles to the north. About five minutes after take-off from the airport, and while the aircraft was in cruise flight at 2,500 feet indicated altitude, the engine began losing power steadily until it reached idle speed. The pilot force-landed the aircraft successfully in a hay field located on the upper slope of a valley.

The pilot carried out an inspection and found that the throttle control cable conduit had separated from the throttle knob assembly, behind the instrument panel. This resulted in loss of throttle control, which allowed the throttle butterfly valve to move to the closed position. Using a pair of vice-grip pliers as a clamp between the two components, the pilot carried out a temporary repair to restore throttle control.

During the take-off from the field, the aircraft failed to reach take-off speed; the aircraft was rapidly approaching trees bordering the field, and the pilot ground looped the aircraft to the right. The left landing gear leg collapsed, and the aircraft skidded about 60 feet before coming to rest in a nose-down attitude on its left wing tip and fuselage.

The pilot thought that a successful take-off was possible from the field and chose a northwesterly direction which offered the longest distance and best wind direction for take-off. The selected take-off path had a three-degree inclined surface. The field, which was bordered by 35-foot-high trees, was rough and covered with grass six to eight inches high, with random clumps up to 12 inches high. The usable distance was about 600 feet long.

The normal take-off distance for this type of aircraft is 850 feet. The area selected by the pilot was unsuitable and of insufficient length for a successful take-off. The landing gear collapsed in overload when the pilot ground looped the aircraft.

FINDINGS:

Cause Related:
1. The pilot selected an unsuitable area for take-off.

2. The left landing gear collapsed in overload when the pilot ground looped the aircraft.

Other:
1. The engine lost power because the throttle control cable conduit had separated from the throttle knob assembly.

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CESSNA 180J SKYWAGON C-GDTL
TIMMINS AIRPORT, ONTARIO
10 MAY 1987

REPORT NUMBER: 87-O/70034 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1710 EDT
OPERATION: Private Testing
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	875	600
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft was being flown locally to check the engine performance after overhaul. After flying for one hour, the pilot returned to the airport and carried out a full-flap power-on approach to land on runway 03. Following initial touchdown, the aircraft bounced, and, on the second touchdown, the left wing dropped, and the aircraft swerved slightly to the right of the runway centre line. After the aircraft had rolled approximately 150 feet, the left landing gear spring strut separated from the aircraft. The aircraft rolled a further 200 feet and then came to rest on the left wing tip on the right-hand side of the runway.

The marks on the runway showed that, following the second touchdown, the left gear was subjected to some side loading probably caused by the aircraft yawing to the right; this in turn subjected the attachment bolt to high tensile loads which stripped the nut from the bolt and allowed the strut to separate from the aircraft. Laboratory examination of the failed outer support bracket did not reveal any pre-existing faults which contributed to its failure, and the failure mode was considered to be overload. The laboratory examination found that the locknut was stripped from a position approximating the correct installed position, in that over 10 threads of the bolt had been stripped.

FINDINGS:

Cause Related:
1. The left main landing gear was subjected to a side load which caused the gear attachment nut to be stripped from the attachment bolt, resulting in a loss of control.

Other:
-Nil-

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CESSNA 172M SKYHAWK N13648
BEAVER CREEK, YUKON
16 MAY 1987

BRIEF NUMBER: 87-W70902 (Accident)
LOCAL TIME: 1315 YDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private (U. S. A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	130	130
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was on a visual flight from Gulkana, Alaska to Whitehorse, Yukon. In the vicinity of Beaver Creek, the pilot encountered snow showers. While attempting to navigate around the snow showers, the pilot flew into a snowstorm. Shortly after the aircraft left the area of precipitation, the engine began to run rough, and the pilot selected the carburettor heat to hot. The engine continued to run rough, and the pilot elected to land on a highway. During the landing, the aircraft ran off the left side of the highway; the left wing struck the ground, and the right gear collapsed.

The engine was checked by a licensed aircraft maintenance engineer in Anchorage, Alaska, and no faults were found which could have caused the engine to run rough.

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CESSNA 172 I SKYHAWK CF-RGW
JOLIETTE AIRPORT, QUÉBEC
16 MAY 1987

BRIEF NUMBER: 87-Q70014 (Accident)
LOCAL TIME: 1700 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	134	75
LAST 90 DAYS	33	33

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was returning to the Joliette Airport after a short flight. The weather conditions were favourable for visual flight. The wind was from the right at 15 gusting to 20 knots and was perpendicular to the selected runway heading. The pilot made his approach with 25 degrees of flaps selected.

The aircraft touched down and drifted to the left. While the pilot was trying to regain the runway centre line, the right wing lifted, and the left wing touched the ground. The aircraft nose dropped, and the aircraft nosed over.

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BOEING PT-17 STEARMAN N49605
TOAD RIVER, BRITISH COLUMBIA
16 MAY 1987

BRIEF NUMBER: 87-W70903 (Accident)
LOCAL TIME: 1500 PDT
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Airline Transport (U. S. A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,700	70
LAST 90 DAYS	95	63

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was ferrying his recently acquired Stearman to Alaska. After touchdown on the 2,300-foot long by 80-foot wide gravel strip, the pilot applied the brakes and the aircraft swung uncontrollably to the right. The aircraft left the airstrip, moved toward the Alaska Highway which was parallel to and close to the airstrip. While the aircraft was moving at about 10 to 15 mph, the right wing tips contacted the right corner of a tractor-trailer moving northbound on the highway.

The left main landing gear brake wheel cylinder seal ruptured and resulted in the left brake being ineffective.

During disassembly, it was discovered that the linkage attachment for the tail wheel steering had failed.

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WIDRIG OUTFITTERS LTD.
PIPER PA-18 SUPERCUB C-FNCH
BONNET PLUME LAKE , YUKON
19 MAY 1987

BRIEF NUMBER: 87-W70028 (Accident)
LOCAL TIME: 1900 PDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,400	800
LAST 90 DAYS	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

Persons at a lodge on Bonnet Plume Lake had inspected the condition of the frozen lake the previous day and had advised the pilot that it was suitable for landing. The flight departed Mayo at about 1700 PDT and arrived at the lake about 1900 PDT. A person on the lake directed the pilot by hand signals to land on a specified area. As the aircraft (on wheels) slowed during the landing roll, the main wheels pushed soft snow and slush in front, and the aircraft nosed over. The aircraft was substantialy damaged; the pilot and passenger evacuated uninjured without difficulty.

* * *

CESSNA 172L SKYHAWK CF-CKS
SILVICAN AIRSTRIP, TAKLA LAKE, BRITISH COLUMBIA
24 MAY 1987

REPORT NUMBER: 87-P70026 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0915 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	283	283
LAST 90 DAYS	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	3	-	-

HISTORY OF THE FLIGHT:

The pilot and three passengers took off from the Hinton, Alberta Airport at 0525 Pacific daylight time (PDT) on a visual flight rules (VFR) flight to Prince George, British Columbia. While en route, the pilot changed the destination to the Silvican Airstrip, which is located beside Takla Lake, and he estimated their arrival time to be 0915 PDT. At about 0900 PDT, the Cessna flew over the Tsayta Lake Lodge where they were to stay for a six-day fishing holiday. The pilot spoke with the lodge owner by radio, then flew on to the Silvican Airstrip, 25 miles to the west. The lodge owner then flew his float-equipped aircraft to the lake adjacent to the airstrip to ferry the occupants of the Cessna to the lodge. On arrival at the airstrip, he discovered that the Cessna had crashed in the woods near the runway and that none of the occupants had survived. There were no witnesses to the accident.

PERTINENT INFORMATION:

The aircraft was in a steeply banked nose-down attitude when it entered the trees. During its descent into the heavily wooded area, the aircraft left horizontal propeller slash marks on the trunk of one tree, 25 feet from the ground. It then crashed into the ground on its nose, at the base of the tree, and, although the aircraft was destroyed, the wreckage was not scattered.

The sky was reported to have been clear, the temperature 11 degrees Celsius, and the winds light. The aircraft had no known pre-flight deficiencies. Evidence at the crash site indicated that the engine was producing substantial power at the time of the accident. The CASB Engineering Laboratory concluded that the engine tachometer was indicating 2450 rpm at the time of impact.

The engine was disassembled and found to be mechanically sound. Fuel was found in the fuel supply system, in the airframe fuel filter, and in the fuel tanks.

Total fuel on board the aircraft at take-off was 230. 4 pounds. According to the Cessna 172 Pilot's Operating Handbook, 192. 9 pounds of fuel would be consumed in 3 hours and 50 minutes, and approximately 37 pounds would still be available at the time of the accident. According to a post-accident estimate of the aircraft's weight and balance, at take-off from Hinton, the aircraft weighed about 2,620 pounds with the centre of gravity 48. 6 inches aft of the datum. Three hours and 50 minutes later, when the accident occurred, the weight would have been about 2,430 pounds with the centre of gravity 48. 7 inches aft of the datum. The certified maximum allowable weight is 2,300 pounds, and the centre of gravity limits are 38. 5 to 47. 3 inches aft of the datum. Therefore, both the weight and the centre of gravity were beyond the prescribed limits.

The accident was not survivable because of the extreme forces involved. The front and back seat floor mounts failed, although three of the four seat-belts held their occupants in place. The forward right seat-belt was not fastened.

The emergency locator transmitter (ELT) did not function because it was damaged in the crash.

ANALYSIS:

The position of the wreckage and direction of flight in relation to the strip suggests that the pilot was manoeuvring to return for a landing after making a low-altitude, slow-speed pass to check the runway condition. Analysis of the impact marks and damage to the aircraft indicated that it had stalled prior to striking the ground. It is probable that the stall occurred in the turn and at an altitude too low for the pilot to regain control before the aircraft struck the trees. The aircraft's stalling speed would have been higher than normal because it was overloaded and the centre of gravity was aft of the prescribed limits; this would have also made recovery from the stall more difficult.

CONCLUSIONS:

Findings:

1. The aircraft stalled before striking the ground.

2. The aircraft centre of gravity was aft of the prescribed limit.

3. The aircraft was over the maximum permitted weight both on take-off and at the time of the accident.

4. The right front-passenger seat-belt was not fastened at impact.

5. The ELT did not function because it was damaged in the crash.

Causes:

The overloaded aircraft, with an aft centre of gravity, probably stalled while the pilot was manoeuvring to land.

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RISK OF COLLISION BETWEEN: MITSUBISHI MU-2E-36 C-GJWM and BEECHCRAFT KING AIR 100 C-GDOU EDMONTON INTERNATIONAL AIRPORT, ALBERTA

25 MAY 1987

REPORT NUMBER: 87-W74051
LOCAL TIME: 1000 MDT
INFORMATION SOURCE: Field Investigation

MITSUBISHI MU-2E-36 C-GJWM

OPERATOR: Canada West Inspection Ltd.
OPERATION: Private Other
DAMAGE: None
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,800	190
LAST 90 DAYS	170	35

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

BEECHCRAFT KING AIR 100 C-GDOU

OPERATOR: Transport Canada
OPERATION: State
DAMAGE: None
PILOT: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	14,000	60	14,000	600
LAST 90 DAYS	75	10	25	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	-

SUMMARY REPORT:

The MU-2 was operating on an instrument flight rules (IFR) flight plan in visual flight rules (VFR) weather with the pilot and a Department of Transport (DOT) inspector on board. The purpose of the flight was to renew the pilot's instrument rating.

The MU-2 was established on the localizer for runway 11 and had just reported inside the Foxtrot non-directional beacon, when a King Air operating VFR turned onto final approach for runway 11 between 50 and 75 yards ahead of the MU-2. The DOT inspector, who was in the right seat of the MU-2, saw the conflicting traffic ahead and took control of the aircraft and made an evasive turn.

To simulate IFR weather conditions, for the purpose of the check-ride, a manila file folder had been placed across the left windshield of the MU-2 by the DOT inspector to block the pilot's forward view. The DOT inspector was to act as safety pilot and maintain a lookout for other aircraft. The file folder on the left windshield obscured the DOT inspector's view, between his 0930 position to about his 1145 position.

Edmonton Terminal Control coordinated the arrival of the MU-2 with the Edmonton International Tower Controller, while the aircraft was on base leg for runway 11, about two minutes prior to the incident. The MU-2 was then vectored to intercept the localizer and cleared for the approach. When the MU-2 was on final approach, two miles from the Foxtrot beacon, the terminal controller advised the crew of traffic at their 10 o'clock position for one and a half miles on base leg for runway 11 and instructed them to contact the tower. The pilot acknowledged and switched to the tower frequency; he assumed there was no conflict as the DOT inspector said nothing.

The first call to tower from the MU-2 reported their position as by the Foxtrot beacon. The tower controller did not respond but was aware immediately of a conflict between the King Air, which was in the same area, and the MU-2 for whose arrival he had not been prepared. He attempted to establish the position of the MU-2 visually; however, he did not see it until the aircraft had started the evasive turn. During this brief period (about 20 seconds), he did not inform the King Air crew of the potential conflict.

The King Air was a VFR flight in the circuit on a crew training exercise, with three pilots on board. The flight originated from the Edmonton Municipal Airport and first contacted Edmonton International on the advisory frequency. The same controller was operating the tower and the advisory positions at the Edmonton International Airport, and the King Air was kept on the advisory frequency while it was in the circuit. The King Air crew was not advised of the MU-2 traffic and did not see the MU-2 before turning onto final approach.

The DOT inspector's use of the file folder to block the view of the pilot during an IFR approach was not in accordance with Air Regulations as it interfered with the DOT inspector's view and prevented him from adequately performing his duties as safety pilot.

As this check-ride was being conducted under simulated IFR conditions, the MU-2 pilot could not have been expected to maintain a look-out for other traffic. When the traffic information was passed by the terminal controller to the MU-2, the pilot assumed that the DOT inspector had located the traffic and had determined that there was no conflict. In fact, the DOT inspector had not located the conflicting traffic, even though its exact position had been reported by the air traffic controller, because the file folder obstructed his view in that direction.

The King Air was held on the advisory frequency while other aircraft in the same airspace operated on tower frequency. Thus, when the MU-2 reported by the Foxtrot beacon on the tower frequency, the King Air crew did not hear this transmission and thus were not aware of the potential conflict. Had they been aware of the conflict, it could have been resolved with about one mile of separation remaining. For undetermined reasons, the crew of the King Air did not see the MU-2 before turning onto final approach.

Although the tower controller received about two minutes warning of the inbound MU-2, he did not immediately determine its exact position and thus was unable to integrate it with other airport traffic, nor did he warn the King Air crew of the possible conflict. When the MU-2 reported by the Foxtrot beacon, the tower controller was not prepared for it; in the 20 seconds between the initial warning and the time that the MU-2 turned, the controller was looking for the traffic. During this period, he did not pass on the traffic information to the other traffic in the area, even though he knew that there was a possible conflict.

FINDINGS:

Cause Related:

1. The crew of the MU-2 did not use a blind flying hood or visor that provided the safety pilot with a clear view of the outside environment.

2. The use of a file folder placed across the pilot's windshield blocked the safety pilot's view.

3. The safety pilot did not see the conflicting traffic reported by the terminal controller.

4. Because the King Air and the MU-2 crews were assigned to operate on different frequencies in the same airspace, they were not aware of each other's position and intentions.

5. The King Air crew's normal scanning technique was ineffective in that they did not see the MU-2.

6. The tower controller did not take positive action to resolve the conflict that he knew existed when: (a) the MU-2 reported by the Foxtrot beacon, and (b) the IFR controller gave him a point-out on the MU-2.

7. The DOT inspector did not adequately perform the safety pilot function when advised of conflicting traffic.

Other:
- Nil -

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MAULE M5-235C C-GDFI
PRINCE GEORGE AIRPORT, BRITISH COLUMBIA 1/2 mi N
26 MAY 1987

REPORT NUMBER: 87-P70027 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1315 PDT
OPERATION: Private
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,800	240
LAST 90 DAYS	25	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot pulled back the throttle to descend for a landing at Prince George, British Columbia. When the throttle was advanced, the engine did not respond. The pilot followed the emergency procedures and attempted to restart the engine by selecting the fuel boost pump on; however, he was unsuccessful. He then carried out an emergency landing in a field short of the airport. The aircraft tail wheel broke off on touchdown, and the left landing gear and strut were damaged when the aircraft ran over a ditch and through a fence. The pilot and passenger were uninjured.

At the time of the accident, the weather was clear with the wind light and variable. The probability of carburettor icing was low.

The pilot had observed fuel dripping from the engine cowling the day before. When the fuel valve was shut off, the dripping stopped. When the valve was reopened, after the aircraft was refuelled, the dripping did not start again. After the accident, fuel was again observed to be dripping from the engine cowling.

Shortly after the emergency landing, the pilot successfully started the engine.

The aircraft was examined at the accident site, and, as the engine and all systems appeared normal, a ground run was carried out. After shutdown, fuel was observed to be dripping from the carburettor airbox drain at the rate of two drops per second. The carburettor was examined on a test bench, and the fuel level in it was found to be about one-half inch too high; this was caused by a groove worn in the rubber tip of the float valve. There was no dirt or foreign matter found in the carburettor that could have prevented the float valve from closing.

With the carburettor installed on the engine, the excess fuel would drip into the carburettor venturi. When the aircraft was in a descent with the power setting at idle, the ram airflow would push the excess fuel upwards into the engine, thus enriching the mixture; the mixture would be further enriched by the windmilling propeller causing the idling engine to suck in a relatively great amount of fuel which would be unburnt and would eventually make the spark plugs too wet to fire. There was no record of the carburettor having been overhauled since it was new in 1979, 1,091 flying hours previously, nor was this a requirement. When the float valve assembly (P/N 233-614) was replaced during the test bench, the result was a correct fuel level and normal functioning of the carburettor.

A General Aviation Safety Information Letter published by the British Civil Aviation Authority indicates that excess fuel in the carburettor can flood the engine and cause it to stop, particularly at low or idle rpm.

The abnormally high fuel level in the carburettor caused fuel to drip into the carburettor venturi and resulted in the fuel mixture being sufficiently overrich to flood the engine when at low power setting, on descent. Turning on the boost pump when attempting the restart increased the fuel pressure, thus making the flooding worse. The engine stopped because the mixture became too rich.

FINDINGS:

Cause Related:

1. The rubber tip of the float needle was worn, allowing excess fuel to flood the engine during a power-off descent and causing the engine to stop.

2. When the boost pump was selected on, the flooding increased.

3. The aircraft ran over a ditch and through a fence during the forced landing in a field.

Other:
-Nil-

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BEECHCRAFT C35 BONANZA C-FHIB
GRENFELL, SASKATCHEWAN 10 mi N
29 MAY 1987

REPORT NUMBER: 87-C70025 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1330 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	175	N/A
LAST 90 DAYS	8	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger, also a licensed pilot, were on a recreational flight. On return, the landing gear was not lowered, and the aircraft landed wheels-up.

The passenger had been flying the aircraft, but the pilot assumed control shortly before landing. The landing gear warning horn had been disconnected because it had been operating continuously.

The change-over of control just prior to landing may have diverted the pilot's attention from the fact that the gear was not down. Because the landing gear warning system was inoperable, there was no warning that the gear was not extended.

FINDINGS:

Cause Related:
1. The pilot did not lower the landing gear.

2. The landing gear warning horn had been disconnected.

Other:
- Nil -

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BEECH A-35 BONANZA CF-HXC
ST-HUBERT AIRPORT, QUÉBEC
29 MAY 1987

REPORT NUMBER: 87-Q74053 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1108 EDT
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	180	23
LAST 90 DAYS	27	23

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot flew to the Saint-Hubert Airport to have his aircraft's radio equipment checked in a specialized workshop. He landed without incident, and, while the aircraft was decelerating on the runway, the landing gear retracted. The aircraft continued for a distance of 130 feet before coming to a stop.

When the aircraft was examined, the landing gear selector was in the gear-up position. The flaps were extended, and the flap selector was in the corresponding position. The doors over the main landing gear were jammed by the wheels in the transition position.

The pilot had 23 hours experience on an aircraft with retractable landing gear. His previous experience had been acquired on a Cessna 172. The landing gear control lever is in the same location in the Bonanza as the flap control lever is in the Cessna 172.

Since the doors of the main landing gear were jammed in the transition position, the landing gear had to be retracted when the aircraft was on the ground. The selection was made while the aircraft's wings were still producing enough lift so that the dampers would be extended, and, consequently, the landing gear's safety microswitch deactivated.

In his attempt to raise the flaps, the pilot confused the Bonanza's landing gear selector with the flap selector and inadvertently retracted the landing gear.

FINDINGS:

Cause Related:
1. The pilot inadvertently retracted the landing gear when he attempted to raise the flaps.

Other:
-Nil-

* * * * *

BEECHCRAFT 95 B55 BARON CF-ISY
ROSSEAU, ONTARIO 5 mi SE
31 MAY 1987

BRIEF NUMBER: 87-O/70040 (Accident)
LOCAL TIME: 1230 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	850	50
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

During the take-off run from a private grass airstrip, the nosewheel sank in a soft area of the strip, and the nose gear failed rearwards. The aircraft propellers and nose structure were also damaged.

The pilot, who was the sole occupant, was uninjured.

* * * * *

AA1B AMERICAN AVN GRUMMAN AMERICAN C-FDXK
KIPLING, SASKATCHEWAN
01 JUNE 1987

REPORT NUMBER: 87-C70026 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0720 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	599	100
LAST 90 DAYS	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger were taking off for a short, visual flight rules (VFR) flight to Carlyle, Saskatchewan. The aircraft became airborne after a short run; however, it would not climb or accelerate. About 250 feet from the end of the runway, the aircraft struck a road embankment and a road sign, travelled an additional 100 feet, and came to rest in a field.

The runway used by the pilot was undergoing repair which left 1,100 feet of usable runway. The aircraft operator's manual showed this length to be adequate under the prevailing conditions of wind, temperature, and aircraft weight. The pilot took off at a lower speed than that recommended by the manufacturer. The lower than normal take-off speed resulted in a nose-high attitude such that the drag produced could not be overcome with the engine power available, and the aircraft would not climb or accelerate.

FINDINGS:

Cause Related:
1. The pilot took off at a speed below that recommended by the manufacturer.

2. Engine power available was insufficient to overcome the excessive drag created by the aircraft attitude after lift-off.

Other:
-Nil-

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CESSNA 150G C-FVYE
MARKHAM AIRPORT, ONTARIO
01 JUNE 1987

REPORT NUMBER: 87-O/70041 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1515 EDT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	11,000	5,000
LAST 90 DAYS	150	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The instructor, with a student aboard, was demonstrating a simulated soft-field landing on runway 09, a paved runway. After touchdown, the aircraft started a gradual turn to the right. The instructor attempted to stop the turn by applying left rudder and left brake but found the pedals ineffective. As the aircraft speed decreased, the turn tightened, and the aircraft struck a ditch on the right side of the runway. At the time of the landing, the wind was from 150 degrees at 10 knots.

The left brake pads were found soaked with hydraulic fluid because the brake piston seal had allowed the fluid to bypass the brake piston, and the left brake was ineffective.

The left steering rod bearing end failed at the nose gear attachment point when the aircraft struck the ditch. The failure mode was in overload; however, the fractured surface did show signs of fatigue.

The right rudder cable failed from tensile overload during the occurrence. Examination of the cable revealed that only a few strands were holding prior to the failure at a place where the cable rolls over a pulley. The lubricant for the pulley had attracted grit which had acted as an abrasive on the cable.

When the aircraft started to veer to the right, probably because of the right cross-wind, the pilot was unable to exercise control because of a malfunction of the control system. The left brake was ineffective because the brake pads were soaked with hydraulic fluid.

The failures of the rod bearing end and the right rudder cable were post-impact and were not contributing causes to this accident.

FINDINGS:

Cause Related:

1. During the landing roll-out, the aircraft veered to the right.

2. The pilot was unable to exercise control because of a malfunction of the control system.

Other:

1. The left brake was unserviceable because the brake pads were soaked with hydraulic fluid.

2. The failed left steering rod bearing end exhibited signs of fatigue.

3. The right rudder cable was excessively worn and failed in tensile overload.

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BEECHCRAFT B35 BONANZA N9035V
HALIFAX, NOVA SCOTIA 25 mi NW
06 JUNE 1987

REPORT NUMBER: 87-A74939 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1653 ADT
OPERATION: Private Recreational
DAMAGE: Nil
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,037	2,300
LAST 90 DAYS	38	38

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was flying a non-stop flight from Long Island, New York to Paris, France. While cruising at 15,000 feet, the aircraft entered cloud and encountered light rime icing conditions. After 10 to 15 minutes in cloud, the engine began to run rough, causing a severe vibration throughout the aircraft. The pilot conducted a cockpit check, which included changing fuel tanks and adjusting power, but could not correct the problem. He requested and received radar vectors for an instrument landing system approach to Halifax International Airport. On descent through 9,000 feet, the vibration stopped, and the pilot landed without further incident.

In Halifax, the fuel, oil, and oil filter were checked, and they were found to be free of contamination. The engine was checked, and a damaged helicoil was found in the number six cylinder. The helicoil was replaced, and the pilot conducted several engine run-ups, which were normal.

Because of this incident, the pilot decided to return to the United States rather than continue his planned flight across the North Atlantic. Approaching Atlanta, Georgia, the engine began to run rough again, and the pilot made a precautionary landing in Atlanta. After another series of run-ups and a subsequent take-off, the engine again ran rough, and the aircraft was grounded in Atlanta.

The engine was inspected by the maintenance company which had recently overhauled the engine. They reported that metal filings were discovered in the primary fuel pump and the finger strainer in the throttle body. They also reported that the primary fuel pump filter strainer was installed upside down, thus allowing the metal filings to bypass the filter strainer. Both the primary fuel pump and the engine driven fuel pump were damaged by the filings, but they still operated.

Officials at Beechcraft Aircraft Corporation were consulted, and their investigation confirmed that the strainer can be installed incorrectly, but there is no reference to this fact in either the V35 Airplane Flight Manual or Shop Manual.

The source of the metal filings could not be determined; however, about 30 flying hours before the occurrence, because of a bird strike, the right wing was removed, and extensive metal work was done inside the wing. In addition, long range fuel tanks were installed for the transatlantic flight, and several fuel lines were opened and reconnected during this work; it is possible that, during this process, metal filings entered the fuel system.

The metal filings were not caught by the primary fuel strainer because the fuel strainer was installed upside down. The metal filings then entered and damaged the fuel pumps, interrupting the fuel flow and causing the engine to run rough. It could not be determined who had installed the filter strainer incorrectly.

CONCLUSIONS:

Findings:

1. The engine ran rough in cruise, causing severe in-flight vibrations.

2. Metal filings entered the fuel system probably during the repair and modification processes.

3. The primary and engine driven fuel pumps were damaged by metal filings.

4. The primary fuel pump strainer was installed upside down, which allowed the metal filings to bypass the strainer.

5. There is no reference in either the V35 Airplane Flight Manual or Shop Manual to the fact that the primary fuel pump strainer can be installed upside down.

Causes:
Metal filings in the fuel system disrupted the fuel flow to the engine.

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PIPER PA-28-180R ARROW C-GIVU
BINSCARTH, MANITOBA
06 JUNE 1987

BRIEF NUMBER: 87-C70032 (Accident)
LOCAL TIME: 1300 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	660	294
LAST 90 DAYS	13	13

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The aircraft failed to attain sufficient airspeed during a take-off from a private strip, so the take-off was rejected. While decelerating, the aircraft drifted left onto soft ground, and the pilot corrected with right rudder. The nosewheel collapsed during the turn. The take-off direction was to the south; the wind was from the southwest at an estimated speed of 10 knots, and the temperature was about 35 degrees Celsius.

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MAULE M-4 N4732T
FORT ST. JOHN AIRPORT, BRITISH COLUMBIA
07 JUNE 1987

REPORT NUMBER: 87-W70904 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1530 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	305	155
LAST 90 DAYS	33	33

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The aircraft, carrying the pilot and one passenger, was on a flight from Madison, Wisconsin to Fairbanks, Alaska and was landing at Fort St. John, British Columbia. On touchdown, the tail wheel of the aircraft started to shimmy, and the aircraft swerved to the left, causing the right main landing gear to collapse. Both occupants escaped without injury.

At the time of the accident, the weather at Fort St. John was clear and the winds were calm.

Several discrepancies were found in the tail wheel assembly: the bolt that attaches the tail wheel assembly to the tail wheel spring was loose and worn, and there was wear between the tail wheel spring and the mounting bracket, which allowed excessive side play. The tail wheel lock was examined and was found to operate normally. The excessive wear allowed the tail wheel to shimmy, causing the pilot to lose directional control and resulting in the aircraft ground looping.

FINDINGS:

Cause Related:

1. The tail wheel assembly attaching bolt was loose and worn.

2. There was excessive wear between the tail wheel spring and the tail wheel mounting bracket.

Other:
-Nil-

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CESSNA 172H C-FVXM
GREENBANK, ONTARIO 7 mi NW
10 JUNE 1987

REPORT NUMBER: 87-O70045 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1730 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	230	110
LAST 90 DAYS	4	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

After taking off from a private grass field, the aircraft climbed to a height of about 30 feet, then began to sink. To avoid trees and power lines at the end of the field, the pilot initiated a right turn towards a small clearing. The right wing tip struck the ground, and the aircraft cartwheeled, coming to rest upright and facing opposite to the direction of travel.

The wind was calm, and the total field available was approximately 1,787 feet, with power lines and 50- to 60-foot trees at the north end. The field had an upslope, and the grass was about four inches tall, with random clumps 8 to 10 inches tall. The take-off was in a northerly direction, and the total ground run was 586 feet. The pilot used a soft-field take-off technique, with 10 degrees of flap selected; the brakes were not released until take-off power was obtained. The pilot reported that the airspeed at rotation was about 65 miles per hour (mph) and that, during the climb-out, the speed never got above 73 mph.

According to the Cessna 172 owner's manual take-off data chart, the required ground roll from a dry, grass runway is 777 feet, and the required take-off distance to clear a 50-foot obstacle is 1,295 feet.

There were no pre-impact malfunctions or failures of the aircraft's flight controls or engine.

Without taking into account that the field was unprepared and had an upslope and long grass, the ground roll was 191 feet shorter than what was required as per the take-off data charts. The use of 10 degrees of flap shortens the required ground run approximately 10 per cent, but this advantage is lost in the climb to a 50-foot obstacle. It is also possible to lift an aircraft off the ground into ground effect with insufficient power or speed to climb out of ground effect. Ground effect can be detected up to a height equal to one wing span above the ground. The wing span of the Cessna 172 is 36 feet 2 inches.

The aircraft's shorter than normal ground run and loss of climb performance when airborne are characteristic of an aircraft becoming airborne early in ground effect and not being able to climb out of it. The use of 10 degrees flap shortened the required ground run but hampered the climb performance of the aircraft once it was airborne. The aircraft had insufficient height to complete the right turn towards the clearing, and the right wing tip struck the ground while the aircraft was still in the turn.

FINDINGS:

Cause Related:

1. The aircraft became airborne early because of ground effect and the use of 10 degrees of flap but could not climb out of ground effect; as a result, it was unable to clear the 50-foot obstacle at the end of the field.

2. The aircraft had insufficient height to complete the turn towards the clearing, and the right wing tip struck the ground.

Other:

-Nil-

* * *

CESSNA 172 C-FVDB
WESTLOCK AIRPORT, ALBERTA
11 JUNE 1987

REPORT NUMBER: 87-W70033 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2130 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	500	70
LAST 90 DAYS	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	1	-

SUMMARY REPORT:

The aircraft had taken off from runway 09 when the engine (Continental 0-300D) began to lose power. The pilot immediately started a right turn back to the runway, but the aircraft stalled and struck trees while in a steep, nose-down attitude. The occupants were seriously injured, and the aircraft was substantially damaged.

Before take off, the pilot was aware that the right fuel tank was about one-quarter full and the left tank was nearly empty. After the accident, three U.S. gallons of fuel were drained from the right tank and about one-tenth of a U.S. gallon from the left tank; this was not adequate for the flight, as it would allow air to be sucked into the fuel system.

The Cessna owner's manual advises against taking off with the fuel gauges indicating one-quarter or less. The manual further advises that the amount of unusable fuel in level flight for each tank is 1.5 U.S. gallons and that the fuel selector should be positioned to "both" tanks for take-off.

The Transport Canada *Flight Training Manual* states that as the angle of bank increases, so does the stall speed. If the angle of bank is increased to 60 degrees then the stall speed is increased by 40 per cent. The training manual further advises that a turn of 180 degrees back to a runway requires an altitude of about 800 feet. The manual recommends that, if the aircraft is not above this altitude, only minor changes in heading should be made.

With the minimal quantity of usable fuel, only one tank selected, and the aircraft in a climbing attitude, air was drawn into the fuel line from the fuel tank, resulting in the engine losing power because of fuel starvation. While turning at low altitude in an attempt to glide back to the runway, the aircraft stalled and crashed.

CONCLUSIONS:

Findings:

1. The flight was commenced without adequate fuel.

2. The engine lost power because of fuel starvation.

3. During an attempted turn back to the runway, the aircraft stalled.

4. Take-off was made with the fuel selector on the right tank instead of both tanks as recommended by the Cessna 172 owner's manual.

5. The pilot took off with the fuel gauges indicating one-quarter or less, which is below the minimum recommended in the Cessna 172 owner's manual.

Causes:
The engine lost power because of fuel starvation as there was not adequate fuel in the tanks. While attempting to make a gliding turn back to the runway, the pilot allowed the aircraft to stall and crash.

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CESSNA 182H SKYLANE C-FSLW
KAMLOOPS, BRITISH COLUMBIA 14 mi E
12 JUNE 1987

BRIEF NUMBER: 87-P74058 (Incident)
LOCAL TIME: 1910 PDT
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,000	600
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was conducting a visual flight rules (VFR) flight from Kamloops, British Columbia to his private 2,200-foot strip, a distance of 14 miles. On departure, the winds at Kamloops were 180 degrees magnetic at 25 knots, gusting at times to 32 knots. The pilot approached his strip from the west at 80 miles per hour; the wind was 90 degrees to the runway at 15 to 20 knots. At 50 to 100 feet above the ground in turbulent air, the pilot encountered a sudden downdraft, and the aircraft landed hard, damaging the landing gear.

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VOLKSPLANE VP-2 (Amateur-built) C-GWPE
STANLEY, NOVA SCOTIA 1 mi NE
12 JUNE 1987

REPORT NUMBER: 87-A70015 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1515 ADT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	160	0
LAST 90 DAYS	1	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot had made adjustments to increase engine rpm and was fast-taxiing the aircraft to see what rpm the engine would produce as the aircraft approached take-off speed. During the run, the aircraft inadvertently became airborne and started to climb. The pilot had not flown regularly for many years and did not have any experience on tail wheel aircraft; however, as there was insufficient runway remaining for an immediate landing, he decided to fly a circuit.

When the pilot tried to turn the aircraft to a left downwind leg, he discovered that the ailerons would not roll the aircraft to a banked attitude. He used rudder to turn, but, each time he applied rudder, the nose of the aircraft dropped and the aircraft started to descend. As the pilot manoeuvred the aircraft to the downwind leg, engine rpm began to decrease, and the aircraft started to lose altitude. When the aircraft reached tree-top level, the pilot closed the throttle and force-landed the aircraft into the trees.

An examination of the airspeed indicator after the accident revealed that the glass face of the instrument had been replaced with a plastic face, and the unit was reading five knots high at airspeeds below 140 knots.

The aileron control system was intact at the time of the impact. Because of the extensive damage to the aircraft, it was not possible to check the cable tension. The ailerons had been rigged on the ground to the trail position. In this type of aircraft, both ailerons will rise when subjected to an air load in flight. No specific rigging instructions were included with the kit; however, the kit manufacturer suggested in a letter to another Volksplane builder that the ailerons be rigged to a position below the trail so that when they are subjected to an air load in flight, they will rise to the trail position.

When both ailerons rise above the trail position in flight, lift on the wings is reduced, and the roll rate of the aircraft is diminished.

The engine was equipped with a Posa carburettor; this type of carburettor uses a slide valve which is spring-loaded to the closed position, instead of the butterfly valve which is used in conventional carburettors. The throttle cable is attached to the valve by running the cable through a slot in the valve to a circular hole designed to hold a retainer attached to the end of the cable. Not having specific instructions on how to attach the cable, the pilot made a coil on the end of the cable and built it up with solder. During the flight, the solder broke into small pieces; a slack in the throttle connection resulted, which allowed the carburettor slide to move toward the closed position.

The rigging of the ailerons may have reduced the effectiveness of the ailerons; however, the complete lack of aileron control described by the pilot was most likely due to a near-stalled condition. This was probably the case, because the airspeed indicator was reading higher than the actual speed. When the engine rpm decreased on the downwind leg because of the slack throttle connection, there was insufficient power for the aircraft to maintain altitude.

CONCLUSIONS:

Findings:

1. The pilot, who had no experience on type or on tail wheel aircraft, was fast-taxiing the aircraft to near the take-off speed.

2. During the fast-taxi check, the pilot's attention was focused on engine rpm, and he inadvertently allowed the aircraft to become airborne.

3. The airspeed indicator was unreliable and probably reading high.

4. Aileron effectiveness was diminished with the aircraft flying near the stall speed and possibly also because of aileron rigging.

5. The method used to attach the throttle cable allowed slack to develop in the throttle cable connection, causing the carburettor slide to move toward the closed throttle position.

Causes:

The pilot allowed the aircraft to become airborne during a fast-taxi check.

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CESSNA 182F SKYLANE C-GHXC
SASKATOON, SASKATCHEWAN
13 JUNE 1987

BRIEF NUMBER: 87-C74069 (Incident)
LOCAL TIME: 1700 CST
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	148	76
LAST 90 DAYS	14	14

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot was attempting to land on a remote gravel strip. On the third attempt, about 5 to 10 feet above the ground, a gust of wind caused the aircraft to rise suddenly, then descend and contact the runway. The aircraft bounced in a nose-high attitude, and the pilot advanced the throttle and lowered the nose. The aircraft again struck the runway hard, causing minor damage. The pilot flew to an alternate airfield and landed safely. The wind was from 60 degrees off the runway heading at 15 to 20 knots.

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SUD AVIATION GY-80-160 GARDAN HORIZON C-FSVI
SNOW LAKE, MANITOBA
14 JUNE 1987

BRIEF NUMBER: 87-C70038 (Accident)
LOCAL TIME: 0940 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	268	36
LAST 90 DAYS	9	9

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

While landing in ideal conditions, the pilot flared too high, and the aircraft stalled. It bounced twice before the landing gear collapsed resulting in substantial damage. The pilot had gone without rest for a period of 20 hours prior to the accident.

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PIPER PA-32-260 CHEROKEE SIX C-FGKN
LAC KEMPT, QUÉBEC 7 mi SE
14 JUNE 1987

REPORT NUMBER: 87-Q70018

		Pilot-In-Command		
Pilot Licence		Private		
Total Flying Time		456 hr		
Total on Type		22 hr		
Total Last 90 Days		27 hr		
Injuries:	Crew	Passengers	Others	Total
Fatal	1	5	-	6
Serious	-	-	-	-
Minor/None	-	-	-	-
total	1	5	-	6

HISTORY OF THE FLIGHT:

On June 14, the aircraft, a Piper PA-32-260 Cherokee Six, registration C-FGKN, departed Réservoir Gouin, Québec, at 1830 eastern daylight time (EDT) for a visual flight rules (VFR) flight to Mascouche Airport, Québec (see Appendix A). No flight plan was filed; however, several acquaintances of the pilot were aware of the departure time and approximate estimated time of arrival in Mascouche. On board were the pilot and five passengers. At approximately 1900 EDT, the pilot contacted other flights in the area and inquired about the en-route weather. At that time, he reported flying at 1,100 feet above ground level (agl), just north of Lac Kempt. There were no other radio transmissions.

On the morning of 15 June, the aircraft was reported missing by one of the pilot's friends. A search operation was initiated, and the aircraft was located the same day, 68 nautical miles from its point of departure, (just south of Lac Kempt), exactly on track. All persons aboard were killed in the crash.

The accident occurred at lat 47°21′N, long 74°07′W, at an elevation of approximately 1,700 feet above sea level (asl). Based on the aircraft's cruise speed versus the distance flown, it was estimated that the aircraft crashed at approximately 1915 EDT during the hours of daylight.east of the accident site) and Lac Dandurand (approximately 30 miles north of the accident site) at about 1800 EDT. Another pilot departed Barrage Gouin for La Tuque at 1535 EDT. He reported a line of thunderstorms to the northwest moving slowly toward the southeast. A third pilot, ahead of the accident aircraft and on a parallel route, reported rain between Parent and Lac Kempt. He reported seeing severe thunderstorms although they were difficult to see due to haze. A short time later, this same pilot returned to his point of departure, passing to the west of Lac Kempt. The thunderstorms he had seen were in the immediate vicinity of Lac Kempt. He reported a line of thunderstorms about 30 miles long, with heavy rain.

PERTINENT INFORMATION:

The accident site was in a wooded area. The general area was relatively flat, with medium to tall trees. Broken tree-tops and ground imprints indicated that the aircraft struck the ground at high speed while in a steep nose-down, right-wing-low attitude, at a measured angle of 60 degrees, on a magnetic heading of 318 degrees (see Appendix B). The right wing left an imprint 16 feet from the broken trees, and the engine and fuselage created a three-foot-deep crater, 37 feet from the initial tree contacts. The aircraft bounced ahead, ploughing and uprooting seven trees, finally coming to rest after travelling a further 17 feet.

From beginning to end, including objects that were flung out, the wreckage trail measured 113 feet, with the greatest concentration of the wreckage found at the 54-foot mark.

The right wing was completely separated from the aircraft and had broken into two major pieces. The right wing outboard panel was severed at tree contact, and total wing separation occurred at ground impact. The left wing inner-half portion remained attached to the fuselage. The outer portion was sectioned by trees. The rear fuselage was broken just aft of the baggage compartment door, but it remained connected to the centre section by the empennage control cables.

Following an initial examination at the accident site, the wreckage was recovered and transported to Montreal for detailed examination.

All flight control cables and control surfaces were accounted for. There were no observed failures of any of the flight control cables, except for the right wing front aileron cable which had failed as a result of the wing breakup at impact.

Examination of the disassembled engine did not reveal any mechanical discrepancies with any of the cylinders, pistons, piston rings, valves, rocker arms, crankshaft, and connecting rods. Most push rods were intact; however, several were bent from impact. There was no evidence of mechanical distress or lack of lubrication throughout the engine. The deformation sustained by the propeller blades and the sheared propeller mounting flange was consistent with engine operation at a relatively high power setting. This was further substantiated by the large quantity of soil and moisture ingested by the engine prior to complete stoppage.

An exhaustive and detailed examination of the powerplant, airframe structure, and systems failed to reveal any evidence of pre-impact mechanical malfunction. All of the damage sustained or failures noted were the result of tree and ground impact.

Only one of the two control yokes was recovered from the wreckage. The installed position of the recovered yoke could not be determined. There was no evidence of pre-impact failure or cracking. The centre hub area was intact and still riveted to its shaft. However, it was broken at the handgrips, suggesting that it was being held at the time of impact.

ANALYSIS:

The aircraft struck the ground in a near-vertical descent at high speed, indicating that the pilot had lost control of the aircraft. The analysis focuses on the pre-impact condition of the aircraft, the weather conditions encountered during the flight, and the actions and decisions of the pilot.

There was no evidence of any aircraft structural failure prior to impact with the terrain. All flight control surfaces were accounted for, and all observed damage to the aircraft was assessed to be the result of impact. Damage to the engine and propeller was consistent with engine operation at a cruise power setting.

Since one of two control yokes was not recovered from the wreckage, it was not possible to establish its pre-impact condition. However, the Board considers it unlikely that problems with the control yoke figured in the sequence of events that led up to the loss of control. Although the required inspection interval had been exceeded, it had only been exceeded by a small amount. Cracking of the control yoke had not been detected on previous inspections, and it is extremely unlikely that, in the period following the last inspection, cracking could have started and propagated to the extent that an in-flight failure of the yoke could have occurred. The recovered yoke showed no evidence of cracking. It was, however, broken at the handgrips, suggesting that it was the pilot's yoke and was being held at the time of impact.

Satellite photographs, radar reports, and pilot reports all indicate that the weather conditions associated with the warm front were in the immediate vicinity of the accident site at the time of the accident. Thus, although it is impossible to establish with certainty the sequence of events that immediately preceded the loss of control, it is clear that it occurred at about the time the aircraft was in the vicinity of a line of thunderstorms which lay across the route of flight.

It is not known if the aircraft entered instrument meteorological conditions, however, it is a distinct possibility. Weather conditions associated with the frontal thunderstorms were characterized by visibilities of about one mile and ceilings below 1,000 feet agl. Although the pilot was reported to have flown in instrument conditions on previous occasions, he was not instrument trained or rated, and the associated turbulence would have posed significant control problems for the pilot. Without the benefit of proper training and experience in instrument flight, there would also be a high potential for spatial disorientation in these conditions. Also, the turbulence associated with the thunderstorms may have been beyond the pilot's or the aircraft's capabilities, leading to a loss of control.

Weather conditions along the route of flight were consistent with the forecast weather available to the pilot prior to departure from Réservoir Gouin. The area forecast for the southern half of the Province of Québec and terminal forecasts applicable to airports near the point of departure and destination all predicted a risk of thunder shower activity in the vicinity of the warm front which was to pass over the area along the route of flight on the afternoon of 14 June.

Prior to departure, the pilot did not obtain the available weather forecasts. Although the terminal forecasts in the surrounding area of the route to be flown did not indicate that conditions would be below those required for VFR flight (clear of cloud and one mile flight visibility), the area forecast made mention that local marginal VFR conditions could be anticipated. The pilot, once airborne, obtained actual weather conditions for St-Michel-des-Saints and Montréal and obtained a pilot report from an aircraft in the vicinity which warned of thunder showers in the area. Although he was aware of the possibility of thunderstorm activity, he would not have been aware of the intensity, extent, and effects of the weather associated with the front.

The accident site was on the direct track between the departure and destination airports. Two aerodromes suitable for a landing were overflown by the pilot only minutes before the accident. When the weather conditions associated with the front were encountered, the pilot did not return to his point of departure, divert to another aerodrome, or deviate around the storm cells.

The Board believes that the pilot underestimated the intensity and effects of the weather associated with the front and continued flight into deteriorating weather. When he encountered conditions beyond his or his aircraft's capabilities, he was unable to maintain control.

CONCLUSIONS:

Findings:

1. Weather conditions along the route of flight were influenced by the passage of a warm front with associated moderate thunder shower activity, low ceilings, reduced visibilities, and severe turbulence.

2. A line of thunderstorms lay across the intended route of flight at about the time of the accident.

3. Prior to initiating the flight, the pilot did not obtain the available weather forecasts.

4. The pilot continued flight into an area of thunderstorms and associated low ceilings, reduced visibilities, and severe turbulence.

5. The pilot was certified and qualified for flight under visual flight rules but was neither certified nor qualified for flight in instrument meteorological conditions.

6. The pilot lost control of the aircraft when he encountered severe adverse weather conditions.

7. With the exception of Airworthiness Directive AD 69-22-2 which had not been accomplished in accordance with the specified time interval, the aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

8. There was no evidence found of any airframe failure or system malfunction prior to or during the flight.

9. There was no evidence of fire before or after the occurrence.

10. The weight and centre of gravity were calculated to be within the prescribed limits.

Causes:

The pilot was not aware of the extent and severity of the en-route thunderstorm activity. He continued flight into severe adverse weather conditions and lost control of the aircraft.

SAFETY ACTION:

Safety Board is concerned over the frequency with which pilots continue VFR flights into adverse weather with fatal results. Thus, the Board is currently conducting a major safety study of approximately 350 accident files where VFR flight was continued into IFR conditions. Inter alia, this study will analyse the typical profiles of the accident pilots and aircraft equipment along with the operating conditions extant at the time of the accidents. An analysis of Canadian regulatory requirements for the conduct of such flights vis-à-vis current operating practices will also be made. In particular, the study will address potential safety deficiencies with respect to the Canadian system for obtaining and maintaining an instrument rating. It is anticipated that this study will result in several major recommendations aimed at reducing the frequency of this type of accident.

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PIPER PA-18A-150 SUPER CUB C-FVPS
ELORA, ONTARIO 3 mi SE
14 JUNE 1987

REPORT NUMBER: 87-O/70046 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1510 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	178	13
LAST 90 DAYS	21	13

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

While the pilot was preparing to land in cross-wind conditions, a gust of wind caused the aircraft to veer to the right. The pilot applied full power to go around but did not have sufficient distance remaining in which to climb over power lines running alongside a road perpendicular to the flight path. The pilot attempted to fly under the wires, and the right main landing gear struck the embankment of the road. Control of the aircraft was lost, and the aircraft cartwheeled to a stop.

The wind was blowing 50 degrees off the runway heading at 10 gusting to 18 knots.

FINDINGS:

Cause Related:
1. During an attempted go-around under gusty cross-wind conditions, the pilot lost control of the aircraft.

Other:
-Nil-

* * *

PIPER PA-25 PAWNEE C-FLUS
MOOSE JAW, SASKATCHEWAN 19 mi SE
14 JUNE 1987

BRIEF NUMBER: 87-C70036 (Accident)
LOCAL TIME: 0945 CST
OPERATION: Private Aerial Spray
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,000	100
LAST 90 DAYS	16	16

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was turning at about 100 feet above the ground in preparation for an aerial spray run. The direction selected for the run was downwind, and the wind was gusting. During the turn, the airspeed decreased, and the aircraft lost altitude. At the same time, the pilot noticed a power line across the flight path. The pilot flew under the wire, but, during the attempted pull-up, the aircraft contacted the ground hard in a nose-up attitude.

* * *

CESSNA A152 AEROBAT C-GLRX
MILL RIVER, PRINCE EDWARD ISLAND
14 JUNE 1987

BRIEF NUMBER: 87-A70016 (Accident)
LOCAL TIME: 1630 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	372	130
LAST 90 DAYS	17	17

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot had completed the landing and was turning to taxi back to the parking area. During the turn, at about three mph, the nosewheel dropped into a six-inch deep ditch at the edge of the grass airstrip. The aircraft nosed down, and the propeller and right wing tip struck the ground.

* * *

AERONCA 7AC C-FLEP
BEISEKER AIRPORT, ALBERTA
14 JUNE 1987

REPORT NUMBER: 87-W70036 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1620 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	195	65
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was departing from Beiseker Airport on runway 16 for a return flight to his home airport. The wind was from the left at 90 degrees to the runway at 10 to 15 knots. Just after becoming airborne, the aircraft drifted right toward a barbed wire fence. The aircraft cleared the fence, but suddenly stalled, and dropped to a road.

Once airborne, the pilot did not employ the proper technique to correct for drift. As the aircraft was clearing the fence, the airspeed decreased, and the aircraft stalled.

The cross-wind component was more than the North American manufacturer's design cross-wind limit for this aircraft type.

CONCLUSIONS:

Findings:
1. The appropriate cross-wind technique was not employed to maintain the runway centre line.

2. As the aircraft was clearing the fence, the airspeed decreased, and the aircraft stalled.

Causes:
The pilot allowed the aircraft to drift toward a fence and then stalled the aircraft as he attempted to fly over the fence.

* * * * *

PIPER PA-18-150 SUPER CUB C-FYJM
VEGREVILLE, ALBERTA 10 mi W
14 JUNE 1987

REPORT NUMBER: 87-W70034 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1045 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	90	10
LAST 90 DAYS	23	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot and passengers departed from the Vegreville Airport on a flight to a farm strip 10 miles to the west. After completing two passes over the strip, the pilot entered a left-hand circuit for a landing from the north end. Full flap was selected on final, and the aircraft touched down 300 feet beyond the threshold. The aircraft bounced twice and veered off the right side of the strip, overturning in a swampy area.

The pilot had recently purchased the aircraft and had received eight hours of dual instruction on tail-wheel aircraft prior to the accident. The pilot had just completed the narrow, 1,300-foot strip on his farm property, but, because of the rolling terrain, several undulations remained at the north end. There were trees up to 35 feet in height at the south end of the strip. At the time of the accident, the wind sock indicated a 90-degree cross-wind from the left at about seven knots.

The pilot, who had limited tail-wheel experience, attempted a full-flap landing in cross-wind conditions on an airstrip that was unsuitable for aircraft operations.

When the aircraft touched down on the undulating surface of the landing strip, it bounced into the air twice. The pilot could not maintain directional control during the landing roll, and the aircraft veered off the strip into a swampy area.

FINDINGS:

Cause Related:
1. The strip was unsuitable for aircraft operations.

2. The pilot was unable to maintain directional control while landing in a 90-degree cross-wind.

Other:
-Nil-

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CESSNA 172L C-FBZS
BARNSTON, QUÉBEC
15 JUNE 1987

REPORT NUMBER: 87-Q70019 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2110 EDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,155	839
LAST 90 DAYS	12	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	1	1

HISTORY OF THE FLIGHT:

The pilot and his two passengers were returning home from a fishing expedition. On final approach for runway 02, the aircraft drifted to the left. The pilot applied full power and carried out an overshoot. During the climb, the stall warning buzzer sounded. The aircraft cleared a power line near the end of the runway before it struck some trees on high rising terrain. It then settled in the trees and caught fire. The two passengers escaped, and the pilot was rescued from the burning aircraft by two witnesses.

PERTINENT INFORMATION:

The weather at the time was scattered cloud 5,000 feet above sea level (asl) with a visibility of 30 miles. The wind was 287 degrees magnetic at six knots. Official darkness for the area was at 2105 eastern daylight time (EDT), and the accident occurred at 2110 EDT.

The pilot was experienced on type; he was accustomed to landing on the strip but had never landed there at night. He mentioned that he felt tired after a 16-hour working day, and thus his judgement was impaired on the initial approach.

The unlighted and unmarked grass strip is oriented 02/20 and is 2,000 feet long and 40 feet wide. Near the end of runway 20, the tree-covered terrain rises and there is a power line.

There were no known mechanical problems with the aircraft prior to the accident. The pilot had conducted the approach with the flaps fully down and the carburettor heat on; he carried out the overshoot in the same configuration. The Cessna 172 operator's manual states that, following a baulked approach, the carburettor heat should be returned to the OFF position and the wing flaps be brought up to 20 degrees immediately.

Air Regulations, No. 804, states that "no person shall take off from or land at an aerodrome at night with an aircraft unless the aerodrome is lighted, as prescribed pursuant to section 311."

ANALYSIS:

The pilot attempted a landing on the unlighted grass airstrip after dark. Because the aircraft drifted to the left on final approach, the pilot executed a missed approach. During the overshoot, the pilot did not raise the flaps, nor did he shut off the carburettor heat, and, as a result, the aircraft was unable to climb to clear the rising terrain near the end of the landing strip.

CONCLUSIONS:

Findings:

1. The pilot had just completed a 16-hour working day.

2. The pilot attempted to land at an unlighted and unmarked grass strip after dark.

3. The aircraft drifted to the left during the approach.

4. The pilot left the flaps fully down and carburettor heat on during the overshoot.

5. There were obstructions at the departure end of the landing strip.

6. On climb-out, the aircraft stalled and struck the trees, then crashed and caught fire.

Causes:

After an unsuccessful night approach to an unlighted and unmarked grass strip, the pilot attempted to carry out an overshoot with full flaps down and carburettor heat on; as a result, the aircraft was unable to clear rising terrain near the end of the strip.

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PIPER PA-28R-200 ARROW II N5202T
GLENCOE, ONTARIO 3 mi SE
16 JUNE 1987

REPORT NUMBER: 87-O/70901 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1240 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	618	590
LAST 90 DAYS	25	25

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on an instrument flight rules flight from Toronto Island Airport, Ontario to Detroit, Michigan. While in cruise at 6,000 feet above sea level, the pilot noticed an increase in the engine noise level, followed by a severe vibration. The pilot declared an emergency with Cleveland Center and informed the controller of his intention to divert to London, Ontario. During the turn toward London, the engine noise and vibrations increased, and the pilot decided to make a forced approach. The pilot lowered the landing gear and selected full flaps. During the descent, he tried different throttle, mixture, and propeller settings, but the engine noise and vibration continued. On short final approach to a grass field, the pilot shut the engine off; the aircraft flew underneath some power lines, and the landing gear struck a fence. The aircraft then struck a parked farm tractor, shearing off the left wing at the fuselage. The aircraft rolled over and slid to a stop. The uninjured pilot was unable to open the door of the aircraft and escaped by kicking out the window on the left-hand side of the cockpit.

When the bottom engine cowling was removed after the accident, the number three cylinder was found to be fractured in the area of the eighth cooling fin. Fatigue cracking extended from an indentation in the exterior surface of the cooling fin. The engine (Lycoming IO-360-C1C) had approximately four hours of flight time since it was last overhauled and painted, and there was gray paint in the damaged area of the cooling fin. The connecting rod had separated from the crankshaft, and there was severe strike damage to the piston. The engine compartment was covered with oil and piston filings, but, the oil filter and screen did not contain any piston filings.

The sudden loss of power and the severe engine vibrations were caused by the failure of the number three cylinder. The cylinder failed in flight because of fatigue cracking which spread from a previously damaged area on the exterior surface of the cowling fin. The presence of paint on the fracture face indicated that the crack was present but was not detected during overhaul. The instantaneous failure was uncontained and resulted in metal filings from the pounding piston covering the engine compartment, rather than being trapped in the oil filter or screen.

FINDINGS:

Cause Related:

1. A crack in the number three cylinder was not detected during overhaul.

2. A uncontained engine failure occurred in flight when the number three cylinder failed in fatigue.

3. On short final approach to land, the aircraft struck a wire fence and a farm tractor, shearing off the left wing at the fuselage.

Other:
-Nil-

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CESSNA 180K SKYWAGON N2919K
GOOSE BAY AIRPORT, LABRADOR
17 JUNE 1987

BRIEF NUMBER: 87-A70903 (Accident)
LOCAL TIME: 1534 ADT
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	893	8
LAST 90 DAYS	170	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The aircraft was landing on runway 08. The wind was from 360 degrees at 10 to 15 knots gusting to 25. After touchdown, a gust of wind caught the tail, swinging the aircraft to the left. The right gear leg broke free of the fuselage, and the right wing fell to the runway. The aircraft slid to a stop.

The pilot was unable to use runway 34 because it was closed due to construction.

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CESSNA 172M C-GEZA
GRAVELBOURG, SASKATCHEWAN
16 JUNE 1987

BRIEF NUMBER: 87-C70041 (Accident)
LOCAL TIME: 2100 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	350	350
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGER	-	-	-

REPORTED CIRCUMSTANCES:

The pilot landed the aircraft with a 90-degree crosswind which suddenly increased and moved the aircraft to the right of the runway. The pilot added power to take off again and to regain control; however, the aircraft continued to the right toward a power line. To avoid a collision with the power line, the pilot reduced the power and landed in a field adjacent to the airport. The aircraft touched down and flipped over.

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AERONCA 7AC CHAMP C-FEWR
STEINBACH, MANITOBA
19 JUNE 1987

BRIEF NUMBER: 87-C70046 (Accident)
LOCAL TIME: 1830 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	157	N/A
LAST 90 DAYS	8	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The aircraft had been untied, and no one was in the cockpit when the pilot attempted to start the engine by swinging the propeller. Believing he had flooded the engine, the pilot switched off the magnetos, opened the throttle, and turned the engine over backwards to clear excess fuel. He then reset the throttle and switches and attempted another start. He thought he had flooded the engine again, and he repeated the engine clearing process. However, because he was engaged in conversation with a bystander, he forgot to reset the throttle to a low rpm position after the clearing attempt. On this attempt, the engine started and went immediately to fairly high power. The aircraft moved forward, and the pilot was unable to enter the aircraft. The right main wheel hit a tie-down, and the aircraft turned and struck a parked aircraft.

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W.A. HINZ & ASSOCIATES LTD.
ROCKWELL 112A C-GJNA
BRIGHTSAND LAKE, SASKATCHEWAN
20 JUNE 1987

BRIEF NUMBER: 87-C70047 (Accident)
LOCAL TIME: 0930 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	600	150
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot arrived overhead the destination airstrip after a 45-minute flight from Saskatoon. He noted that the wind sock indicated a light southerly wind and set up for a landing on the appropriate runway. The aircraft landed with the landing gear retracted. The pilot, who was wearing a full head-set, did not complete a pre-landing check and did not hear the gear warning horn.

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CESSNA 175 CF-KXN
TOMAHAWK, ALBERTA 3 mi E
21 JUNE 1987

REPORT NUMBER: 87-W70038 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1110 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	150	87
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

Forty minutes after the aircraft took off on a visual flight rules flight from Whitecourt to Ponoka, the engine (Continental GO-300) began to lose power. The pilot attempted to correct the problem but was unsuccessful. He was diverting to a nearby airport when a severe vibration began and the cockpit filled with smoke. The pilot carried out a forced landing on a narrow rural road. During the landing roll, the left wing of the aircraft struck some trees that bordered the road; the aircraft then swerved left into a ditch and was substantially damaged.

The engine had not been overhauled for 20 years, and it had accumulated 700 hours of flying time during this period; of this flying time, less than 100 hours were logged in the last 10 years. During this time, there were many intervals in excess of 90 days between flights, and most recently, there were periods of over one year between flights. The owner of the aircraft did not take any measures to preserve the engine during the periods that the aircraft was not used. Teledyne Continental Service Bulletin M84-10 details the requirements for indefinite engine storage (more than 90 days). Examination of the engine revealed that there was a hole through the upper crankcase above the number one cylinder. The engine was disassembled, and it was found that the number one connecting rod bearing had failed which led to the failure of the number one connecting rod. Several of the other connecting rod bearings were pitted and corroded, and their corresponding crankshaft journals showed signs of high heat distress. All the cylinders had internal corrosion pitting.

During the many extended periods of inactivity, the oil film had dissipated from the internal surfaces of the engine. This allowed corrosion of many parts and, when the engine was started, the momentary operation of the engine without lubrication. Several of these dry starts eventually caused the failure of the number one connecting rod bearing and the subsequent failure of the number one connecting rod. The owner had not taken the required action to preserve the engine in accordance with Teledyne Continental Service Bulletin M84-10; such action could have prevented this failure.

FINDINGS:

Cause Related:

1. The engine failed because of repeated starts without lubrication to the bearings.

2. The owner of the aircraft did not follow the recommended practice for preserving the engine during periods of inactivity.

Other:
-Nil-

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CESSNA 210M CENTURION II N8208M
NORTH MONETVILLE, ONTARIO
21 JUNE 1987

BRIEF NUMBER: 87-O/70902 (Accident)
LOCAL TIME: 1215 EDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	788	36
LAST 90 DAYS	13	13

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot and three passengers, with personal baggage, were to fly from North Monetville, Ontario to Buffalo, New York. Prior to take-off, all engine indications were normal, and the pilot released the brakes and began the take-off roll. The runway was a dry, grass strip 2,800 feet long. The wind was a head wind at five knots. As the aircraft accelerated through 40 knots indicated airspeed (KIAS), the pilot thought the aircraft's acceleration seemed slow and lifted the nosewheel off the ground to determine if the IAS was correct. When the aircraft remained on the ground, the pilot lowered the nosewheel, checked the engine quadrant, and continued the take-off. With 600 feet of runway remaining and at a speed of 55 KIAS, the pilot aborted the take-off. He applied maximum braking; however, the aircraft overran the runway and struck a tree. A post-impact fire destroyed the aircraft.

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PIPER PA-28-181 ARCHER C-GPJH
REDFORD, YUKON TERRITORIES 4 mi W
23 JUNE 1987

REPORT NUMBER: 87-W70039 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1200 YDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	108	23
LAST 90 DAYS	23	23

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and one passenger departed Dawson City, Yukon on a local sightseeing flight. Approximately two hours later, the engine lost all power, and a forced landing was carried out into a clearing. After a 60-foot ground roll, the nosewheel dug into the muskeg and broke off, and the aircraft nosed over.

The pilot and passenger were co-owners of the aircraft. Both believed that the aircraft had over five hours fuel endurance at 65 per cent power. This belief was based on information in the pilot's operating handbook. The aircraft had been refuelled to full tanks (50 U.S. gallons) the day prior to the accident and had been airborne for two hours and six minutes on the flight to Dawson City. On the morning of the accident, the crew had checked the fuel tanks with a dip stick and had estimated that there were two and one-half hours of fuel remaining. They flight-planned for a 1 hour and 30 minute flight but later extended their flight plan for an additional 30 minutes. One hour and 52 minutes after take-off, the engine lost all power; the total taxi and flight time for the two flights was four hours and six minutes. Immediately following the accident, the pilot removed both fuel tank covers and noted that the tanks contained no fuel; no discrepancies were found in the fuel system.

A post-crash analysis of the fuel consumed on the trip from Calgary to Dawson City revealed that the average fuel consumption was 11.6 U.S. gallons per hour. It is likely that this rate of consumption continued to the time of the accident, and the fuel consumption during the total four hour and six minute taxi and flight time would thus have been 48 U.S. gallons, the total usable fuel capacity of the aircraft. The loss of power was therefore caused by fuel exhaustion.

Any decrease in the actual endurance compared to the information given in the pilot's operating manual would be due to the pilot's operating technique and the condition of the engine.

FINDINGS:

Cause Related:
1. The pilot misjudged the aircraft fuel consumption, resulting in fuel exhaustion and the subsequent power loss.

Other:
-Nil-

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CESSNA 170B CF-TTA
VAUXHALL, ALBERTA
25 JUNE 1987

BRIEF NUMBER: 87-W70042 (Accident)
LOCAL TIME: 2045 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	134	57
LAST 90 DAYS	1	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

While on a local practice flight, the pilot diverted to another airport to carry out circuits. The wind at the airport was a 40-degree cross-wind at 5 to 10 knots. During the first landing, the pilot lost control of the aircraft, and the right wing and engine struck the runway.

The pilot had flown one hour in the past 90 days and had carried out three landings.

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AERONCA 7DC CHAMPION CF-NTO
LACOMBE, ALBERTA
25 JUNE 1987

REPORT NUMBER: 87-W70041 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1100 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	450	87
LAST 90 DAYS	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

On the take-off roll, the aircraft, carrying the pilot and passenger, swerved to the right to the edge of the runway, then to the left across the runway and through a barbed wire fence. When the aircraft struck the fence, the right landing gear was torn off. The two occupants escaped without injury.

The pilot had learned to fly in World War II. In the late 1970s, he took a refresher pilot training course. Later, he purchased a Cessna 150 and a Grumman Cheetah on which he accumulated approximately 200 hours. The pilot was not current on tail-wheel-equipped aircraft; he had not flown this type of aircraft since taking his initial training in 1943 and 1944.

During the take-off roll, the pilot overcontrolled and then lost directional control of the aircraft.

FINDINGS:

Cause Related:

1. The pilot was not current on tail-wheel-type aircraft.

2. During the take-off roll, the pilot overcontrolled and then lost directional control of the aircraft.

Other:
-Nil-

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CESSNA 210 C-GVPU
SANDSPIT AIRPORT, BRITISH COLUMBIA
27 JUNE 1987

REPORT NUMBER: 87-P70043 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1438 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	650	30
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

On approach to land at Sandspit Airport, British Columbia, the pilot selected the gear down. The gear appeared to extend normally, but the gear-down light failed to illuminate. The pilot then attempted to lock the gear with the emergency hand-pump but found that it would not move the gear any further, nor would the gear-down light illuminate. The pilot landed after flying past the flight service station operator, who informed him that the gear appeared to be down. Shortly after touchdown, the right gear collapsed, and the aircraft swung violently to the right. The aircraft came to rest 80 feet off the side of the runway.

Examination revealed that the right main gear saddle assembly had failed, causing the right gear leg to collapse. Further examination by the CASB Engineering Laboratory showed all fracture surfaces structures of the saddle to be consistent with ductile overload failure. No evidence of pre-cracking or progressive failure modes could be detected.

The aircraft had recently been imported from the United States. As the aircraft had not been flown for over five years, an extensive Inspect Test Repair As Necessary (ITRAN) was carried out, and the aircraft was certified as airworthy. The American logbooks indicated that both the left landing gear saddle (Part No. 1241004-1) had been replaced 350 flight hours previously, and the right landing gear saddle (Part No. 1241004-2) had been replaced 250 flight hours previously. Airworthiness Directive (AD) 76-14-07 R2 requires that these parts be replaced every 1,000 hours.

The aircraft was being operated from a rough logging airstrip and had flown 22.2 hours since being imported to Canada.

The right saddle had failed in overload, causing the gear to collapse, but exactly when it had failed was not determined.

CONCLUSIONS:

Findings:
1. The right landing gear collapsed on landing.

2. The right-hand saddle, part number 1241004-2, failed in overload prior to the landing.

3. There was no evidence of pre-cracking or progressive failure.

4. It was not determined when the failure occurred.

5. The aircraft swung uncontrollably to the right off the runway and was substantially damaged.

6. The aircraft was being operated from a logging airstrip.

Causes:
The right main gear saddle failed in overload.

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FORNEY MANUFACTURING COMPANY AIR PRODUCTS (ERCO) 415C C-FLUV
SAINT-FLAVIEN, QUÉBEC
28 JUNE 1987

BRIEF NUMBER: 87-Q70024 (Accident)
LOCAL TIME: 2155 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	560	135
LAST 90 DAYS	150	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was taking off from a private airstrip on which only the grass in the centre had been cut. The wind was light, and visibility was good, with light rain falling. During the ground run, the left wheel was slightly out of alignment with the airstrip, and it came into contact with the 18-inch-high grass. The additional drag started a strong yawing movement to the left. The pilot cut off power and tried unsuccessfully to correct his bearing by using the rudder control bar instead of the handwheel, which is the recommended procedure. The left wing tip was damaged with it struck an automobile parked near the runway. The pilot exited uninjured, and the aircraft sustained substantial damage when it suddenly came to rest in a depression in the ground.

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CESSNA 182 N8834T
DEAN RIVER, BRITISH COLUMBIA
30 JUNE 1987

BRIEF NUMBER: 87-P70909 (Accident)
LOCAL TIME: 2130 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,000	1,000
LAST 90 DAYS	35	35

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot made his approach to the very rough gravel strip at an airspeed of 70 knots, with the flaps fully extended. The aircraft touched down on the main wheels, and, when the nosewheel touched the ground, the pilot heard a noise. He raised the nose, slowed the aircraft down, and, when he lowered the nose again the front of the aircraft went all the way to the ground. The nosewheel had broken, and the nose landing gear collapsed. It appeared that the nosewheel had struck a rock.

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QUICKIE 2 (Amateur-built) N5538N
DAWSON CREEK AIRPORT, BRITISH COLUMBIA
30 JUNE 1987

REPORT NUMBER: 87-W70905 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2238 MDT
OPERATION: Private Testing
DAMAGE: Destroyed
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	507	150
LAST 90 DAYS	31	27

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot of the amateur-built aircraft was flying from his home in Ohio to Alaska, where he had obtained a summer job. While he was en route up the Alaska Highway, the engine (Continental 0-200A) gave indications of low power. The pilot landed at Dawson Creek, British Columbia and, over a period of several days, carried out a partial top overhaul. Following a test flight after the completion of the engine repairs, the pilot conducted a low altitude pass over the Dawson Creek Airport, parallel to runway 06. As the aircraft passed the terminal, it began a pull-up manoeuvre. Witnesses saw the left rear wing fold over the top of the fuselage, and the aircraft then rolled left and struck the ground. The pilot was fatally injured.

PERTINENT INFORMATION:

Weather conditions at the time of the occurrence were clear and were considered not to be a factor in the accident.

The wing of the Quickie 2 is a composite structure consisting of a shaped foam core overlayed with laminated fiberglass and resin layers. The designer's manual details a procedure used to correct wing "creep" or deformation that can occur if the wing is not properly supported until it is "cured." This involves spraying the upper wing surface black to absorb solar heat and retwisting the wing to the correct wash-out angle.

After the aircraft had been constructed, the owner adjusted the left wing wash-out by solar heating and twisting which caused the aircraft skin to debond.

The Canadian Aviation Safety Board Engineering Laboratory determined that the foam core construction of the left wing was not in accordance with the Quickie 2 designer's drawings and that the wing had experienced debonding of the foam planks comprising the modified core, prior to the crash.

A kink was present in the second zero-degree ply just outboard of BL30 and had been there since the wing was constructed, weakening the wing an unknown amount; the upper zero-degree ply showed no corresponding kink.

There was misalignment in the 45-degree plies of the outboard left wing skin, causing these unidirectional plies to be more spanwise than called for, thereby reducing the wing's torsional stiffness.

The emergency locator transmitter (ELT) battery was time-expired and was found in a discharged condition.

ANALYSIS:

The construction discrepancies revealed by the Engineering Laboratory examination of the wing, combined with the skin debonding, resulted in a structural failure of the wing in the static divergence mode during a pull-up manoeuvre.

CONCLUSIONS:

Findings:

1. The left wing was not constructed in accordance with the designer's drawings.

2. Skin debonding occurred during efforts to adjust wing wash-out by solar heating.

3. The left wing failed in the static divergence mode.

4. The ELT battery was time-expired and was found in a discharged condition.

Causes:
The left wing was not constructed in accordance with the designer's drawings and recommended procedures.

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CESSNA P206D C-FYCQ
WESTLOCK, ALBERTA
01 JULY 1987

REPORT NUMBER: 87-W70044 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1400 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,800	800
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	1	5

SUMMARY REPORT:

The aircraft with six parachutists on board departed Westlock Airport and climbed to 3,000 feet above ground level (agl) to drop one student jumper. The flight was then to continue to a higher altitude for the remaining parachutists. When near the drop point, the jumpmaster requested the pilot to reduce power, and he re-checked the student's equipment. The specially designed right door was opened, and the student started to exit the aircraft onto the step, placing his hands on the wing strut. The jumpmaster, who was holding the student's drogue chute in his hands, noticed the parachute bag flapping. At this point, the jumpmaster shouted "Go" to the student and, at the same time, threw the drogue chute under the tail of the aircraft. The drogue chute deployed the main canopy which, in turn, pulled the student backwards, off the aircraft. As the student left the aircraft, his legs flipped up, and his right leg struck the horizontal stabilizer. The impact broke the student's leg and damaged the aircraft. When the pilot realized his aircraft control movements were restricted, he instructed the remaining parachutists to exit the aircraft. He then landed the aircraft without further incident.

Before the parachutists board the aircraft, the equipment is checked by the jumpmaster. When the aircraft is approaching the drop zone, the jumpmaster again checks the equipment. The jumpmaster then holds the drogue chute in his hand and returns to his position beside the pilot, facing rearward. The student is directly to the rear of the aircraft, facing forward. When the pilot reduces power, the student, assisted by the jumpmaster, comes forward and exits the aircraft onto the step, placing his hands on the strut. The student then moves his hands to position himself on the outboard end of the wing strut. When the jumpmaster is satisfied that everything is right, he shouts "Go", and the student lets go of the strut. At the same time, the jumpmaster releases the pilot chute from his hand.

At some point, between the time the jumpmaster checked the student's equipment and the time the student moved onto the step, his parachute bag was opened, probably by the student snagging it while he was moving about inside the aircraft. An unsecured parachute bag commands immediate release of the parachutist from the aircraft if he is already in the air stream. If part of the loose canopy caught in the wind stream, the whole parachute would be pulled out and become entangled in the tail plane.

The word "go" in sky diving is a positive command, regardless of position, but the student was unaware of the problem, and he did not respond to the command. When the main parachute opened, it pulled the student from his position, and his right leg struck the horizontal stablizer.

FINDINGS:

Cause Related:
1. The parachute bag flap opened for undetermined reasons.

2. The student jumper did not respond to the command "Go", and when the jumpmaster released the drogue chute, the main parachute opened, dragging the student into the aircraft's horizontal stabilizer.

Other:
-Nil-

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PIPER PA-28-140 CHEROKEE C-FQJM
SAVERY ISLAND, BRITISH COLUMBIA
02 JULY 1987

BRIEF NUMBER: 87-P70047 (Accident)
LOCAL TIME: 2045 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	360	50
LAST 90 DAYS	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot landed the aircraft in the centre of the sand-covered runway, where the ground was firm. During the landing roll, the aircraft drifted to the right where the right main wheel caught in the soft sand on the side. The aircraft veered to the right, and the nosewheel contacted a rock, causing the nose gear to snap off.

The pilot landed toward the setting sun, and it was shining in his eyes during the landing flare and touchdown. He did not overshoot because there were trees on each side and at the end of the runway which he thought, because of the sun's glare, he might hit.

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PITTS S-1 N17KL
MOOSE JAW, SASKATCHEWAN 10 mi NE
03 JULY 1987

REPORT NUMBER: 87-C70903 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2010 CST
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,100	220
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot was conducting a short, local flight to practise aerobatic manoeuvres. The airplane completed a series of looping manoeuvres, recovering at heights of less than 100 feet above the ground. The final manoeuvre was an outside loop, and, as the aircraft approached the top of the loop, it appeared to slip or slide sideways before continuing. The loop was completed at low altitude with the aircraft in the inverted attitude. The pilot then rolled the aircraft upright; the nose dropped during the roll, and, although the pilot raised the nose just prior to impact, the aircraft struck the ground in a wings-level attitude and burst into flames. The pilot was killed.

PERTINENT INFORMATION:

The weather was excellent with scattered clouds, good visibility, and light winds.

The aircraft was consumed by fire. An examination of the wreckage revealed no evidence of pre-impact failure. The aircraft had undergone an annual inspection about three weeks prior to the accident. Witnesses said the engine sound remained constant throughout the series of manoeuvres. The weight and balance were within the prescribed limits.

The aerobatic sequences were being conducted in a north-south direction over a farm field. In the field, there was a dyke which ran perpendicular to the direction of flight. No marks were found on the dyke or in the vegetation on it, nor in the field north of the dyke. Marks made by the three landing gear wheels started at the edge of the cultivation south of the dyke, four and one half feet below and 39 feet horizontally from the nearest high point of the dyke.

There was no evidence to indicate that incapacitation, physiological, or psychological factors affected the pilot's performance. It was known that he was obsessed with aerobatic flying and had performed in competitions. He practised three or four times a week during the summer months, normally at a minimum altitude of 1,000 feet above ground. Recently, witnesses had noted that the aerobatic manoeuvres were being carried out well below this altitude. The pilot had undergone aerobatic training three years earlier, and his instructor had noted that he had required more than the normal amount of instruction and that he was not a natural aerobatic pilot. He had advised the pilot to conduct his manoeuvres at a safe altitude.

ANALYSIS:

The impact marks relative to the dyke and the direction of flight indicate that the aircraft's pitch attitude was changed sharply, in a nose-up direction, after the aircraft passed the dyke. This indicates that pilot was attempting to avoid the ground just prior to the impact. The pilot demonstrated poor judgement by conducting aerobatics at a level too low to provide a safe margin for error.

CONCLUSIONS:

Findings:
1. The aircraft struck the ground while the pilot was conducting low-level aerobatics.

Causes:
The aerobatics were being flown at an altitude that did not provide a safe margin for error.

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PIPER PA-18-150 (160) SUPER CUB N7063D
WATSON LAKE , YUKON TERRITORY 5 mi S
05 JULY 1987

REPORT NUMBER: 87-W70906 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1700 PDT
OPERATION: Private Ferry
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	535	60
LAST 90 DAYS	45	24

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot departed Fort. St. John, British Colombia on a flight to Watson Lake the aircraft fuel tanks filled to capacity and a jerry can containing six U.S. gallons for a total of 42 U.S. gallons of fuel. on a flight to Watson Lake Y.T.. Two brief stops were made en route, during which the fuel from the jerry can was added,as no other fuel was available. About 15 miles short of destination, the engine lost all power. A forced landing was carried out into tall trees, destroying the aircraft. The pilot and passenger escaped with minor injuries.

The aircraft had been modified by the installation of a 160 horsepower engine.

Examination of the wreckage revealed that there was no fuel on board the aircraft. The pilot did not have a pilot operating handbook for the aircraft, but he had determined from fuel consumed on previous flights that his maximum endurance was six hours; the pilot estimated that the 400 nautical mile flight would take five hours. Performance information for this engine indicates that it burns 7.5 gallons per hour when leaned for maximum economy at the power setting that was used. The 42 U.S. gallons available would therefore give 5.6 hours endurance with no allowance for take-offs and climbs to altitude. The total air time when the engine lost power was 5 hours and 18 minutes.

The engine lost power because of fuel exhaustion because the pilot's estimate of the fuel required for the trip did not include the fuel required for run-up, taxiing, and three take-offs and climbs to altitude.

FINDINGS:

Cause Related:
1. The pilot underestimated the fuel required for the flight.

2. The engine lost power because fuel exhaustion.

Other:
1. A pilot's operating handbook was not available to the pilot.

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CESSNA 182P SKYLANE C-FRFY
MEDICINE HAT, ALBERTA 32 mi W
05 JULY 1987

REPORT NUMBER: 87-W70048 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2031 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	550	220
LAST 90 DAYS	50	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

SUMMARY REPORT:

The aircraft was cruising at 4,500 feet above sea level (asl) when the engine stopped. The pilot completed the engine failure check-list and transmitted a MAYDAY. Engine power was restored for about 15 seconds, and, when the engine stopped again, the pilot activated the ELT and trimmed the aircraft to glide at 80 knots. The pilot prepared to make a forced landing on hard-packed prairie and turned downwind. After turning onto base leg, he selected 10 degrees of flap; on final approach, the pilot felt that the rate of descent was too great, and he pulled the nose up. The stall warning horn sounded, and the pilot levelled the aircraft and selected full flap, believing that this would reduce the rate of descent. The aircraft made a hard landing at 50 to 60 knots, while drifting to the right; during the landing, the aircraft nosed down to the right and then settled back onto the main gear.

Before departing Regina, the aircraft had been refuelled to capacity at the flying club. The pilot had checked the drains for water contamination but had not checked the fuel tank caps. When the aircraft was inspected after the accident, the fuel tanks were empty, the fuel lines to the carburettor contained no fuel, and only about two ounces of fuel remained in the carburettor. Fuel stains were evident on the upper right wing surface, the right side of the fuselage, and the upper and lower surfaces of the right horizontal stabilizer. The right-hand fuel cap was checked and found to be in good condition. A quantity of fuel was then put into each tank, and the fuel system was checked for leaks, but none were found. Before the investigators arrived at the site, the pilot had removed both wing fuel tank caps, and therefore the security of the right wing fuel cap before the accident could not be determined. When closed properly and tested, the fuel tank cap did not allow fuel to leak. The left and right fuel tanks on this aircraft are interconnected to allow fuel to flow from one to the other, and there is no check valve.

After the aircraft was refuelled at Regina, the pilot did not check the security of the fuel caps before flight. The evidence indicates that the right-hand filler cap was not secured and fuel siphoned out during flight. As the fuel tanks are interconnected, the fuel was depleted from both tanks, and the engine stopped because of fuel exhaustion. When the engine stopped, the pilot commenced a forced approach during which the airspeed decreased and a high rate of descent resulted. When full flap was selected at a low airspeed, the high rate of descent was increased, which resulted in a hard landing.

FINDINGS:

Cause Related:

1. The pilot did not check the security of the fuel tank caps.

2. The fuel from both tanks siphoned from the right tank filler hole during flight, and, as a result, the engine stopped because of fuel exhaustion.

3. The pilot allowed the aircraft to enter a high rate of descent during the forced landing approach resulting in a hard landing.

Other:
-Nil-

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PIPER PA-28-140 CHEROKEE C-GIKV
BRAMPTON AIRPORT, ONTARIO
06 JULY 1987

REPORT NUMBER: 87-O/70052 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1430 EDT
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	280	1
LAST 90 DAYS	65	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft took off from runway 15 of the Brampton Airport and was at height of approximately 50 feet when the engine (Lycoming O-320-E2A) lost power. The aircraft pitched nose down, and the engine regained power, but, as the pilot made a left turn for short final to runway 26, the engine lost power again. The aircraft descended, struck the ground in a left-wing-low, nose-down attitude, and slid sideways to a stop just beyond the end of runway 15.

The emergency locator transmitter (ELT) was switched off. It was the portable, hand-held type, which has to be switched to the ON position before a signal can be transmitted.

The left and right wing fuel tanks were approximately one-half full. The fuel selector was selected to the left tank, and the boost pump had been turned on for the take-off. There was no blockage in the fuel lines between the left tank and gascolator bowl, which is located on the forward left side of the firewall.

There was a large fuel streak on the underside of the fuselage on the left side. The streak started just aft of the gascolator drain valve and ended at the tail cone. A fresher fuel stain was evident aft of the gascolator drain valve and forward of the left wing root. Because of the attitude of the aircraft, the drain valve could not be looked at immediately after the accident; however, it was checked after the aircraft was moved. The valve did not appear to be leaking, but only light finger pressure was required on the plunger to release fuel.

The engine was inspected and found to be capable of producing power.

The fuel system on this aircraft has the fuel pump located between the fuel tank and the carburettor. If there is a leak in the fuel line between the pump and the tank, at a point higher than the level of fuel in the tanks, air will be drawn in through the leak instead of fuel from the tank.

The presence of fresh fuel stains on the bottom of the fuselage aft of the gascolator drain valve indicated that the valve was leaking at some point on the accident flight. During lift-off, the aircraft was rotated to a nose-high attitude. The fuel level in the tanks was lower than the gascolator drain valve. Air was then able to enter through the valve, a condition which prevented the fuel from reaching the carburettor, and the engine lost power as a result of fuel starvation. When the nose was lowered, the flow of fuel was restored, and the engine regained power. As soon as the pilot turned left to return to the airport, the fuel level of the left tank, which was the one selected, was again lower than the drain valve, and the engine lost power again.

After the first power loss, the pilot prepared for a forced landing in the field beyond runway 15, but, because the engine regained power, he decided to attempt a landing on runway 26.

FINDINGS:

Cause Related:
1. The gascolator drain valve allowed air to enter the fuel lines.

2. The air in the fuel line resulted in fuel starvation and loss of engine power.

3. The aircraft struck the ground during the attempt to return and land on runway 26.

Other:
-Nil-

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CESSNA 120 C-FJLM
NEW HAZELTON, BRITISH COLUMBIA 10 mi E
07 JULY 1987

BRIEF NUMBER: 87-P70048 (Accident)
LOCAL TIME: 2100 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	45	1
LAST 90 DAYS	29	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was taking off downhill from a soft, rough, grass strip which was located at the juncture of two river valleys. He rejected the take-off when it became apparent that he had insufficient space. The aircraft could not be stopped before it overran the strip.

There was no wind sock on the field which is subject to unstable and variable wind conditions because of local terrain features. The pilot had attempted the take-off in gusty tail wind conditions.

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CESSNA 172M SKYHAWK C-FEAD
ENDEAVOUR, SASKATCHEWAN 9 mi E
08 JULY 1987

BRIEF NUMBER: 87-C70051 (Accident)
LOCAL TIME: 1930 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	93	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot, with two passengers on board, was taking off for a visual flight rules (VFR) flight in the local area.

During the take-off roll, the aircraft drifted off the runway; the nosewheel struck a mound of soft earth, and the aircraft nosed over.

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PIPER PA-22-150 TRIPACER C-FISC
MOOSE LAKE AIRSTRIP, BRITISH COLUMBIA
13 JULY 1987

REPORT NUMBER: 87-P70050 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1830 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,125	150
LAST 90 DAYS	75	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot and two passengers were flying in the Piper Tripacer from Anahim Lake, British Columbia to Moose Lake, British Columbia on a pleasure flight in visual flight rules conditions. During the landing roll in gusty winds at Moose Lake, the aircraft began to swing to the right. The pilot counteracted with left rudder and then left brake, but neither was effective in stopping the swing, and the aircraft ground looped, damaging the empennage and the left wing.

The aircraft had been modified to tail-wheel configuration and fitted with toe brakes. After the accident, it was found that the rudder cable pulleys were worn and the rudder cables were slack. The slack rudder cables allowed the rudder pedals to contact the firewall before the rudder was fully deflected. The movement of the brake pedals was restricted when the rudder pedals were against the firewall, and thus full braking was not available. Following the accident, the worn pulleys were replaced and the rudder cables were tightened. This restored the rigging of the rudder control system.

The pilot was unable to control the aircraft when landing in gusty winds because the aircraft's rudder cables were slack.

FINDINGS:

Cause Related:
1. Due to slack rudder cables, neither full rudder travel nor full braking action was possible, and the pilot lost control of the aircraft.

Other:
-Nil-

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CESSNA 180 CF-KKU
KELOWNA, BRITISH COLUMBIA
13 JULY 1987

BRIEF NUMBER: 87-P70051 (Accident)
LOCAL TIME: 1450 PDT
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,500	900
LAST 90 DAYS	100	25

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot was aware that both the left and right brakes were soft and unresponsive and planned his landing to accommodate a no-brake landing. On the landing roll, however, at about 20 knots, the brakes were applied, and the right brake caught and turned the aircraft to the right. The pilot was unable to control the turn with the left brake, and the aircraft ground looped to the right. The left wing tip and left elevator were damaged as the aircraft ground looped.

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CESSNA 195 N9800A
KELOWNA AIRPORT, BRITISH COLUMBIA
15 JULY 1987

BRIEF NUMBER: 87-P70904 (Accident)
LOCAL TIME: 1208 PDT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Airline Transport (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	15,000	100
LAST 90 DAYS	240	35

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was receiving conversion training on the tail-wheel aircraft. The wind was light and variable at the time. The first touch-and-go landing was normal, but the pilot had difficulty maintaining directional control on the roll-out. The instructor regained control and then let the pilot continue the landing roll. As the aircraft slowed down, a swing to the right developed. The instructor took control but, because the left brake was soft, was unable to regain control, and the aircraft ground looped. During the ground loop, the left main wheel broke off, and the landing gear collapsed.

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PIPER PA-24-260 COMMANCHE N8665P
FREDERICTON, NEW BRUNSWICK
15 JULY 1987

REPORT NUMBER: 87-A70904 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1359 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,150	245
LAST 90 DAYS	75	67

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger were on a flight from Burlington, Vermont to Newfoundland with a planned stop at Fredericton, New Brunswick. During the final approach to runway 33, at an altitude of 200 feet above ground level and an airspeed of 110 mph, the aircraft started to yaw to the left. The pilot applied right rudder and aileron, but she was unable to realign the aircraft with the runway, so she carried out an overshoot. The pilot flew the second approach slightly lower, intending to land close to the threshold of runway 33. When the airspeed was reduced to 110 mph, the aircraft started to yaw to the left again; this time, the pilot felt that she would not be able to clear the trees running parallel to the runway if she overshot, so she decided to land. When the aircraft landed, it was yawed to the left about 15 degrees. The right main landing gear touched down first; the aircraft then bounced three times and came down hard on the nose gear, breaking it off. The aircraft skidded on its nosewheel piston for 800 feet before coming to rest on the edge of the runway.

The wind was 310 degrees magnetic at five knots, thus creating a left cross-wind component for landing.

During examination of the aircraft after the accident, a small screw was found lodged in a pulley of the rudder control system; the pulley was located beneath the rudder pedals directly under the instrument panel. Marks on the pulley indicated that the screw had been moving around inside the cable groove in the pulley. At one point in the examination, the rudder jammed when being moved from right to left. It is not known where the screw came from; however, there had been some radio work carried out on the aircraft about a month prior to the accident, and the screw found is of the size and type commonly used in radios.

The screw had moved around the cable groove in the pulley to a position adjacent to the pin used to prevent the cable from coming off the pulley. When this happened, the cable was forced against the pin, preventing further movement of the rudder and causing the pilot to lose directional control on landing. Because the screw was able to rotate around the cable groove in the pulley, the restriction to rudder movement was able to occur at any position of the rudder control.

FINDINGS:

Cause Related:
1. A small screw lodged in the cable groove of one of the pulleys for the rudder control system restricted rudder movement and caused a loss of directional control during the landing.

2. It could not be determined where the screw came from.

Other:
- Nil -

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PIPER PA-34-200T SENECA II C-GDRD
ST-HUBERT AIRPORT, QUÉBEC
17 JULY 1987

REPORT NUMBER: 87-Q70027 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1130 EDT
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	8,300	16
LAST 90 DAYS	180	16

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

After take-off, the landing gear failed to retract. The gear-up position was reselected, but the gear still did not retract, and the pilot decided to return and land. When the gear was selected down, the main landing gear would not lock in the down position. Both the normal and the emergency gear lowering systems were employed in an attempt to lock the main landing gear down, but without success. Fuel was burned off while radio consultation with ground personnel was carried out, and the aircraft was prepared for a gear-unsafe landing. The landing was carried out in accordance with the checklist procedures. The main gear collapsed on touchdown, and the aircraft slid to a stop, supported by the nose gear and the aft fuselage.

The aircraft hydraulic system is pressurized only when the gear is in the retraction or extension cycle. When completely up or down, the system is depressurized. Examination of the nose gear hydraulic actuating cylinder determined that it was incorrectly assembled, and it leaked under normal pressure, thus producing a hydraulic failure after take-off. The main landing gear was partially retracted when the hydraulic system pressure failed, and the airflow forced the nose gear to the aft-locked position.

The airflow does not assist in the retraction of the main landing gear.

Emergency gear lowering is effected by the release of any residual hydraulic pressure, following which the gear will fall to the extended position, and the gear overcentre locks will engage due to momentum. Because the main landing gear was in a partially extended position, the gear could not develop sufficient momentum in the fall to engage the overcentre locks.

No attempt was made to assist the main landing gear to lock into place by manoeuvring the aircraft. The emergency check-list procedures for this aircraft do not specify that the pilot should manoeuvre the aircraft to assist the landing gear to lock down when the gear lowering system fails. However, this is considered to be normal practice for many aircraft types.

The hydraulic failure caused by the incorrect assembly of the nose gear actuating cylinder rendered both the normal and emergency landing gear systems ineffective, and this resulted in the main gear not being locked down.

It is possible that the gear would have locked into the down position had the pilot manoeuvred the aircraft to assist in extending the wheels.

FINDINGS:

Cause Related:
1. The nose gear actuating cylinder was incorrectly assembled and leaked hydraulic pressure, resulting in a hydraulic failure which rendered the normal and emergency landing gear systems ineffective.

Other:
-Nil-

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AERONCA 0-58B DEFENDER C-FFYS
SUSSEX, NEW BRUNSWICK
17 JULY 1987

BRIEF NUMBER: 87-A70022 (Accident)
LOCAL TIME: 1820 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	112	4
LAST 90 DAYS	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was flying a familiarization flight in the tail-wheel-equipped aircraft, with the aircraft owner as a passenger. The final approach was started at 500 feet above ground level at the normal indicated airspeed of 65 to 70 mph. The pilot attempted a wheel landing, and the aircraft touched down hard and bounced twice. The aircraft remained on the runway after the second bounce; however, the pilot overcontrolled with rudder, and the aircraft ground looped to the left. The aircraft came to rest in the alders at the edge of the runway.

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CESSNA 182Q SKYLANE N5164N
RESOLUTE BAY, NORTHWEST TERRITORIES
65 mi SW
18 JULY 1987

REPORT NUMBER: 87-C70905 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1330 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	381	95
LAST 90 DAYS	45	45

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The pilot and passenger were conducting an instrument flight rules (IFR) flight from Cambridge Bay to Resolute Bay, Northwest Territories. One hundred miles from destination, the engine began to run rough; carburettor heat was applied but with no effect. The aircraft descended into cloud, and soon the engine lost all power. The pilot attempted to restart the engine without success, and a forced landing was carried out on the shoreline of an island. During the landing roll, the nose-wheel dug into the shale beach, and the aircraft nosed over.

The aircraft was at 11,500 feet above sea level on top of an overcast cloud layer when the engine started running rough. The temperature and humidity at that altitude were conducive to carburettor icing.

There was no evidence of fuel contamination or of mechanical failure of the engine. However, the carburettor heat shroud for the carburettor heat system was found to have 9 of its 12 rivets sheared; this produced a one-half inch split along the side of the carburettor heat shroud. The cause of the sheared rivets could not be determined.

The pilot encountered carburettor icing which caused the engine to run rough. Carburettor heat was applied, but the split in the carburettor heat shroud resulted in reduced carburettor heat output, and the carburettor icing condition could not be corrected. Additional carburettor ice formed during the descent in cloud, causing the engine to lose all power.

CONCLUSIONS:

Findings:

1. The aircraft flew into conditions conducive to carburettor icing which affected engine performance and subsequently resulted in the loss of all power.

2. The carburettor heat system was not able to counter the effects of the carburettor icing, due to a separated carburettor heat shroud.

3. The carburettor heat shroud separated because 9 of 12 shroud rivets had sheared.

Causes:

The carburettor heat shroud split open because of sheared rivets, and, as a result, there was insufficient heat to remove icing; the reason for the sheared rivets could not be determined.

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MOONEY M20J N4015H
MONT SAINT-HILAIRE, QUÉBEC
20 JULY 1987

REPORT NUMBER: 87-Q70901 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1313 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	722	35
LAST 90 DAYS	14	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	1	1	1

HISTORY OF THE FLIGHT:

The pilot and three passengers took off from Québec City, Québec at 1230 EDT, for Watertown, United States. The pilot had planned a visual flight rules (VFR) flight at an altitude of 2,500 feet above sea level (asl). However, in the area of Trois-Rivières, weather conditions deteriorated, and the pilot had to descend to remain in VFR conditions. He also changed his flight plan to track to the Saint-Jean Airport. Approaching Mont Saint-Hilaire, the aircraft entered a cloud layer at an altitude ranging from 900 to 1,300 feet asl. The pilot hesitated to descend when he entered the clouds because he was already flying at an altitude that was below the minimum altitude in the sector. The pilot did not see the mountain in time to avoid it; he pulled up the nose of the aircraft when he saw trees, and the aircraft struck several trees and came to rest on the ground.

The pilot and the passenger in the front escaped uninjured. However, one of the passengers in the rear suffered serious injuries, while the other passenger was fatally injured.

PERTINENT INFORMATION:

Before leaving Québec City, the pilot had telephoned for weather forecasts relating to his flight path and destination. The pilot learned that he would have to pass through a warm front between Québec and Watertown and that he could expect rain showers and fog to reduce visibility to between two and six miles. He could also expect to encounter local rain showers during the storms and fog, resulting in ceilings of 600 to 1,500 feet asl and visibility of two to five miles. The pilot also received aweather bulletin that stated there were isolated showers moving eastward in the Trois-Rivières sector and that visibility might be reduced to half a mile. Actual en route conditions generally corresponded to the forecasts. A few minutes after the accident, the Montréal Control Centre observed a zone of heavy precipitation about three miles east of Mont Saint-Hilaire.

Approaching Saint-Jean, the pilot consulted his visual chart and observed that the minimum sector altitude at which to fly safely was 1,700 feet asl. The pilot had also received the local altimeter setting and had selected it on his altimeter.

At the time of the accident, the aircraft was cruising at 1,300 feet asl. The top of the mountain was 1,336 feet asl.

The pilot was not IFR qualified; however, he was taking a course to obtain the endorsement fo this type of flight.

The investigation did not reveal any technical or mechanical malfunction of the aircraft. The aircraft weight was 58 pounds over the maximum allowable gross weight; however, the centre of gravity was within the prescribed limits. The right rear section of the fuselage was heavily damaged when the right wing separated at the wing root. The four occupants were wearing seatbelts and shoulder harnesses.

ANALYSIS:

The aircraft struck the top of the mountain when the pilot was manoeuvring in instrument flight conditions. Since the aircraft was already flying below the minimum sector altitude, the pilot did not descend to remain within visual conditions when the aircraft entered the clouds. In such conditions of reduced visibility, the pilot did not see the mountain in time to avoid it. On impact with the trees, the right wing tore off at the wing root and the aircraft rolled to the right.

The passengers in the rear were injured when the right rear section of the fuselage was damaged, after the right wing separated.

CONCLUSIONS:

Cause Related:
1. The aircraft struck the top of the mountain when the pilot was manoeuvring in instrument flight conditions for which he was not qualified.

2. The pilot did not see the mountain in time to avoid it.

Other:
1. At the time of the accident, the aircraft was 58 pounds over the maximum allowable gross weight.

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PIPER PA-34-200T SENECA C-GTIX
ST. JOHN'S AIRPORT, NEWFOUNDLAND
21 JULY 1987

REPORT NUMBER: 87-A74074 (Incident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 2040 NDT
OPERATION: Private Recreational
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	900	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was attempting to start the aircraft to taxi to the hangar. The left engine would not start, so he attempted to start the right engine. There was a smell of something burning, and the start was aborted. After a few seconds, the pilot again attempted to start the right engine, and the burning smell became even more evident; the start was again aborted. The pilot exited the aircraft and found smoke seeping from the nose compartment door. He called the fire department, and they extinguished the fire.

Maintenance personnel examined the nose compartment and found that the positive terminal battery cable and battery post had completely burned away from the battery and that heat had damaged the cover and three filler caps on that end of the battery. There was also some damage to adjacent wiring and insulation. The battery was examined by the Canadian Aviation Safety Board Engineering Laboratory; there was no evidence found of any internal shorts.

According to Transport Canada records, Piper Service Bulletin 836A, Aluminum Wire Inspection/Replacement, issued to prevent overheating of the battery positive post by replacing the aluminum cable in the electrical system with copper cable had not been complied with. However, there was not enough evidence available to determine if this non-compliance caused the overheating, nor was the extent of the corrosion determined beyond the corrosion deposits found on the positive terminal battery cable, this cable being the standard factory equipment copper cable.

It is possible that there were corrosion deposits on the battery positive post which led to heat buildup during the attempts to start the engine, resulting in the fire.

CONCLUSIONS:

Findings:
1. The positive cable and post overheated and burned, separating from the battery.

2. Corrosion deposits were found on the copper positive terminal battery cable.

3. Although the aircraft was equipped with a copper positive battery cable, there was no record to indicate that Piper Service Bulletin 836A was carried out on this aircraft.

Causes:
The cause of the fire was not determined.

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STINSON 108-3 N6783M
MACKENZIE, BRITISH COLUMBIA
22 JULY 1987

REPORT NUMBER: 87-P70905 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1340 PDT
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Airline Transport (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,885	180
LAST 90 DAYS	27	27

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The aircraft, which was on a ferry flight from California to Alaska, took off from Mackenzie, British Columbia after refuelling. The aircraft had levelled off, and the pilot was reducing power when oil began to appear on the top cowling and soon spread over the windshield and side windows, obscuring the pilot's view. The engine oil pressure decreased, and the oil temperature rose. The pilot attempted to return to Mackenzie Airport, but the aircraft struck a tree at the edge of the airport and crashed while the pilot was manoeuvring to land. The aircraft was substantially damaged; both occupants escaped without injury.

The engine and propeller were removed and taken to an overhaul facility for examination. Prior to disassembly, the oil system was pressurized, and it was found that oil escaped through a one and one-half inch split in the deteriorated diaphragm (part number B-119-2) in the propeller hub assembly. No other cause for the loss of oil was found.

A review of the Aircraft Log Books revealed that the last recorded installation of a new B-119-2 diaphragm was in 1978. Although the manufacturer's manual recommends that the diaphragm be replaced at propeller overhaul or every 250 hours, the aircraft had flown 1,090 hours since the diaphragm was last replaced.

There is a safety feature in the propeller mechanism which prevents loss of engine oil in the event of a leak developing in the diaphragm; if a leak occurs, the oil supply to the propeller can be shut off by pulling the propeller control to the extreme aft position, past the normal high pitch setting.

The diaphragm, which had exceeded its recommended service life, deteriorated and split, allowing engine oil to be lost. The pilot did not follow the emergency procedure of pulling the propeller control fully aft to prevent further loss of oil. The windshield and side windows became coated with oil, thus obscuring the pilot's vision, and the aircraft struck a tree while the pilot was manoeuvring to land.

CONCLUSIONS:

Findings:
1. The recommended service life of the diaphragm in the propeller hub had been greatly exceeded.

2. The deteriorated diaphragm split, allowing engine oil to be lost.

3. The pilot did not use the recommended emergency procedure to minimize the loss of engine oil.

4. The leaking oil covered the windshield and side windows, obscuring the pilot's vision.

5. The aircraft struck a tree while the pilot was manoeuvring to land.

Causes:
The propeller diaphragm was not changed as recommended, and the deteriorated diaphragm split, allowing engine oil to be lost.

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AERONCA 7AC CHAMPION C-FDNN
COBDEN/BRUCE MCPHAIL MEMORIAL AIRPORT, ONTARIO
22 FEBRUARY 1987

BRIEF NUMBER: 87-O/70012 (Accident)
LOCAL TIME: 1350 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	340	200
LAST 90 DAYS	4	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

Shortly after take-off, the pilot noticed the fuel gauge indicator wire, seen directly out through the front of the windshield, was registering an empty tank. The fuel tank had been filled to the top prior to departure; however, suspecting an imminent engine failure, the pilot made a precautionary landing back to the airfield. A landing spot was chosen, into light winds, near the hangar and gas pumps abeam runway 30, despite the pilot's knowledge that the snow-covered surface there was rough and drifted. The aircraft touched down gently on the crest of the first snowdrift, bounced slightly, and the left landing ski struck a second higher drift. The left ski dug into the snow, the left undercarriage collapsed, and the aircraft nosed down.

The cork float of the fuel measuring device was not secured to the indicator wire, which allowed the wire to slide through the cork. Although the fuel tank was full, the indicator showed that the tank was empty.

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CESSNA A185F SKYWAGON C-GTYH
LAKE ABITIBI, ONTARIO
07 MARCH 1987

REPORT NUMBER: 87-O/70015 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1515 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	665	665
LAST 90 DAYS	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	1	-

HISTORY OF THE FLIGHT:

The pilot and two passengers departed from Bobs Lake on a local ice fishing trip. The ski-equipped aircraft stopped at several ice fishing locations. While flying southbound along the narrows of Lake Abitibi, at approximately 100 feet above ground level (agl), the aircraft made a climbing right turn, which brought it over the centre of the narrows. It then immediately entered a steep left bank. During the turn, the right wing suddenly dropped, and the aircraft pitched nose-down while rotating to the right and crashed in the bush on the east side of the narrows. The pilot and front seat passenger were fatally injured. The other passenger sustained serious injuries.

PERTINENT INFORMATION:

The nearest meteorological reporting station to the accident site was Timmins, Ontario, approximately 60 nautical miles east. At 1500 EST, Timmins was reporting a broken ceiling of 20,000 feet agl, visibility of 10 miles in light haze, a temperature of 13 degrees Celsius and a dew point of 3.9 degrees Celsius. The wind was 290 degrees magnetic at 13 knots. At the accident site, the conditions were similar, warm with a light wind out of the north.

The narrows are oriented in a north/south direction. The ice surface was snow covered, approximately 500 metres wide and in excess of 5,000 metres long. Two aircraft were parked at the narrows, and the pilots were ice fishing at the time of the accident.

An autopsy was carried out, and the pilot's blood-alcohol level was determined to be at least 146 milligrams per cent (mg%). By medico-legal definition, the pilot was suffering from ethyl alcohol intoxication at the time of the crash.

The back-seat passenger sustained serious head and internal injuries. He did not recall any of the events which led up to the accident.

The aircraft struck the rising ground 75 feet from the shoreline of Lake Abitibi, in a steep, nose-down attitude while rotating to the right. The fuselage aft of the cabin area broke apart, and both passengers were thrown out the back of the aircraft. Both front seats failed during the impact sequence. None of the occupants was wearing seat-belts at the time of the accident.

The engine was determined to have been operating at high power at the time of impact. There was no evidence of any pre-impact engine or airframe failure; however, a subsequent teardown at the CASB Engineering Laboratory did confirm the existence of a pre-impact crack in the crankcase. The crack originated at the top rear cylinder deck stud of the number six cylinder. This is an area identified by Airworthiness Directive (AWD) 77-13-22 as being subject to cracking on certain serial numbers of Continental IO-520D engines. The AWD was not applicable to this engine because the engine serial number was outside of those identified in the directive.

ANALYSIS:

The purpose of the flight was to visit a number of local lakes to go ice fishing, so it is probable that, after seeing the two aircraft parked on the narrows, the pilot decided to land there also. During the steep left turn possibly to orient the aircraft into wind, the aircraft stalled and entered an incipient spin to the right. The pilot was unable to recover, and the aircraft crashed into the trees.

The pilot's blood-alcohol level would have adversely affected his ability to fly the aircraft; it would have impaired his judgement and his coordination. This impairment probably led to the steep climbing turn during which the aircraft stalled. This impairment would have degraded the pilot's performance and affected his ability to recover from the stall.

The crack in the engine crankcase was not related to the engine operation at the time of the accident.

FINDINGS:

Cause Related:

1. By medico-legal definition, the pilot was suffering from ethyl alcohol intoxication at the time of the crash.

2. The aircraft's right wing stalled while in a steep left bank, and the pilot was unable to regain control of the aircraft.

Other:

1. The engine crankcase had a crack developing from the top rear cylinder deck stud of the number six cylinder.

2. None of the aircraft occupants was wearing a seatbelt at the time of the accident.

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CESSNA 185A SKYWAGON C-FBWP
POPLAR HILL, ONTARIO
03 APRIL 1987

BRIEF NUMBER: 87-C70013 (Accident)
LOCAL TIME: 1155 CST
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,492	451
LAST 90 DAYS	54	34

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot landed the ski-equipped aircraft on an ice strip. A strong wind was blowing from the south, and the pilot landed on the most into-wind runway, anticipating a 30- to 40- degree cross-wind from the right.

After landing, the pilot was unable to maintain directional control because of the cross-wind, and the aircraft turned 90 degrees to the right. The left ski dug into snow on the side of the strip, and the left main landing gear collapsed.

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CESSNA A185F SKYWAGON C-GTNL
SAULT STE MARIE, ONTARIO
04 APRIL 1987

BRIEF NUMBER: 87-O/70021 (Accident)
LOCAL TIME: 1605 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	628	124
LAST 90 DAYS	28	28

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The aircraft landed hard, the left landing gear leg failed, and the aircraft nosed over.

The runway is 1,400 feet long and is aligned north/south with pine trees bordering both sides. The wind was from 300 degrees at 13 to 15 knots. The final approach was flown toward the north at an airspeed of 55 knots with the flaps extended. As the aircraft descended below the tree line, the rate of descent increased rapidly, and the aircraft struck the runway heavily.

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CESSNA 185F SKYWAGON C-GZTQ
COCKBURN ISLAND, ONTARIO
10 APRIL 1987

BRIEF NUMBER: 87-O/70023 (Accident)
LOCAL TIME: 1930 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,175	1,575
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot and three passengers were on a visual flight rules (VFR) flight from Sudbury, Ontario to Cockburn Island. At destination, the aircraft landed hard, the right main gear collapsed, and the aircraft ground looped.

The aircraft landed on an easterly heading; the wind was from the south at five knots. The strip had a sand surface.

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CESSNA A185F SKYWAGON II C-GHPI
NAIN, NEWFOUNDLAND 65 mi W
16 APRIL 1987

BRIEF NUMBER: 87-A70008 (Accident)
LOCAL TIME: 1300 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	540	52
LAST 90 DAYS	28	28

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was flying the ski-equipped aircraft to the site of a hunting camp, intending to land on a snow-covered lake. During the landing, the right ski tip dug into the snow, and the right ski and wheel separated from the aircraft. The aircraft continued on the left ski for approximately 50 feet before the right gear leg dug into the ice, causing the aircraft to slew to the right. The left gear then separated from the fuselage, and the aircraft came to rest in a nose-down, left-wing-low attitude. After take-off at Nain, people on the ground had observed the right ski hanging down; however, the pilot was not aware of this condition and had continued to the hunting camp.

The aircraft was examined, and it was discovered that a bolt which connects the right bungie to the rigging cable was missing and the right ski was hanging too low on the safety cable.

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LAKE LA-4-200 BUCCANEER C-GHJF
CAMLACHIE, ONTARIO 4 mi NW
17 APRIL 1987

REPORT NUMBER: 87-O70026 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1400 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	221	28
LAST 90 DAYS	35	28

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

SUMMARY REPORT:

The pilot, with three passengers on board the hull-type amphibian aircraft, departed from a private aerodrome in the Wyoming, Ontario area and proceeded to Lake Huron to carry out some practice water landings. A sheltered area close to shore was selected, and, after circling once to check for obstructions on the water, the pilot approached toward the north for a touch-and-go landing on the water. On contact with the water, the aircraft bounced twice, then struck the water surface in a steep nose-down attitude, and came to rest right-side-up. The pilot successfully beached the aircraft on the nearby shore.

Weather conditions at the time were good for visual flight, with a light wind from the north. The water surface was calm, but swells were present. Trim changes are unconventional in this aircraft, that is, the nose will tend to pitch down with the application of power to the pylon-mounted engine. The aircraft was not equipped with a shoulder harness.

The pilot was attempting to land into the swells. On touchdown, the aircraft hull struck a swell, causing the aircraft to bounce into the air. The airspeed decreased, and, when engine power was applied, the nose of the aircraft pitched down. The pilot did not compensate for the nose-down pitch trim change when power was applied, and, as a result, the aircraft struck the water in a nose-down attitude. Had a shoulder harness been installed and worn, the pilot may have been able to control the aircraft.

FINDINGS:

Cause Related:

1. The aircraft bounced when the hull struck a swell during an attempted water landing.

2. During recovery after the second bounce, the pilot did not adequately compensate for the unconventional nose-down pitch trim change when power was applied, and the aircraft struck the water in a nose-down attitude.

3. The lack of a shoulder harness may have contributed to the pilot's difficulty in controlling the aircraft.

Other:
-Nil-

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AERONCA 7CCM CHAMPION C-FJBE
SIOUX LOOKOUT, ONTARIO 23 mi S
30 APRIL 1987

REPORT NUMBER: 87-C70019 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1130 CDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	800	535
LAST 90 DAYS	11	11

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was taking off from a small lake after gathering minnows. Immediately after lift-off, the pilot initiated a steep turn to the right to avoid a stand of tall trees bordering the shoreline. The aircraft stalled and descended into the lake.

The pilot, a non-swimmer, wore a life-jacket and was able to reach the shore.

The weight and balance were within prescribed limits, and all aircraft systems were serviceable.

The pilot elected to depart from a confined area into wind rather than attempt a cross-wind take-off which would have afforded him a longer water run. The direction selected allowed a water run of approximately 1,300 feet.

The pilot's decision to take off in a confined area necessitated a steep turn immediately after lift-off before the aircraft had time to accelerate. There was insufficient airspeed to maintain flight, and the aircraft stalled at an altitude from which recovery could not be effected.

The life-jacket worn by the pilot undoubtedly contributed to his survival and enabled him to reach the shore.

FINDINGS:

Cause Related:
1. A steep turn at a low airspeed caused the aircraft to stall at an altitude from which recovery could not be effected.

2. The take-off was made from a confined area with insufficient distance available to safely avoid obstacles at the departure end.

Other:
1. The pilot's life-vest was instrumental in enabling the pilot to reach the shore following the accident.

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CESSNA 185F C-GWNU
NEJANILINI LAKE, MANITOBA
04 MAY 1987

REPORT NUMBER: 87-C70020 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 2000 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	1,200
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

SUMMARY REPORT:

The amphibian aircraft was taking off from a muddy dirt strip for the return flight to Churchill. Just prior to lift-off, the pilot began to lose directional control of the aircraft. The pilot lowered the flaps and pulled the aircraft into the air. The aircraft settled back onto the strip, and the pilot decided to reject the take off. The nosewheel contacted a snowbank on the side of the runway, and the aircraft nosed over. All five occupants escaped uninjured.

The pilot had walked the 2,000-foot strip prior to the take-off. The strip was muddy, and there were snowbanks on both sides.

The pilot had filed a 16-hour flight notification. When this expired, search and rescue activity commenced, and the aircraft was located very shortly thereafter. The pilot had removed theemergency locator transmitter and placed it on the roof of a nearby cabin. The device was serviceable, but the antenna was not attached to it, and, as a result, the range of the ELT was reduced significantly. A fully operational ELT would have been vital if the accident had resulted in major injuries.

When the pilot rejected the take-off from the muddy dirt strip, he lost directional control of the aircraft. As a result, the nosewheel hit the snowbank, causing the aircraft to nose over.

FINDINGS:

Cause Related:
1. During the rejected take-off from a muddy, dirt airstrip the pilot lost control of the aircraft.

Other:
1. The ELT did not have an antenna attached.

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CESSNA A185E SKYWAGON C-FQLD
WABAMUN LAKE, ALBERTA
08 MAY 1987

REPORT NUMBER: 87-W70025 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1045 MDT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		STUDENT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	7,500	20	125	6
LAST 90 DAYS	30	1	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot-in-command was carrying out a float-training exercise with a licensed private pilot at the controls. One normal float landing had been completed, and one simulated glassy water approach had been rejected. The second approach was made with power on and 40 degrees of flap selected. The airspeed was about 80 mph, and the descent rate was 200 to 300 feet per minute. On touchdown, the aircraft cartwheeled about the right float and wing tip, and came to rest in an inverted attitude in the water. The student and pilot-in-command escaped from the aircraft with minor injuries.

The approach was made into a light easterly breeze, and there was enough of a ripple on the water surface to provide some depth perception. The aircraft was observed to have levelled off at about three feet above the water and was flown at this height for about 100 feet before touching down. Neither pilot was aware of this short period of level flight.

There were no reported or identified aircraft mechanical deficiencies. The nose of the right-hand float showed signs of compression damage consistent with a slightly right-wing-low, nose-down attitude at touchdown.

The Cessna Owner's Manual Supplement for float planes states that, with glassy water, it is recommended that a power-on approach and landing be made with 0 to 20 degrees of flap, in order to maintain a low rate of descent. The use of 40 degrees of flap while maintaining 80 mph on approach would have placed the aircraft in a slightly nose-down attitude. When the pilot inadvertently levelled off at about three feet above the surface, he probably eased the control yoke forward to resume his descent rate. This action would have caused the nose to drop, and, when the right float dug into the water, the aircraft cartwheeled.

FINDINGS:

Cause Related:
1. An incorrect technique was used to fly the simulated glassy water approach.

Other:
-Nil-

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PIPER PA-18 SUPER CUB C-GYDA
PICKLE LAKE, ONTARIO 45 mi SW
08 MAY 1987

REPORT NUMBER: 87-C70021 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0900 CDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	756	80
LAST 90 DAYS	35	26

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

After retrieving minnows from traps, the pilot of the float-equipped aircraft taxied into position for take-off from the small lake. After a normal water run, the aircraft lifted off and was climbing away when the engine power became intermittent, and the aircraft could not maintain altitude. The floats contacted trees, and the aircraft nosed over.

The pilot had limited experience on float-equipped aircraft.

Surface winds were from the southwest at 10 gusting to 20 knots, and the visibility was unrestricted. The temperature and dew point readings were not conducive to carburettor icing at high power settings.

The aircraft weight and centre of gravity were within limits. The fuel storage tank at the main base and the aircraft fuel tanks and fuel system were found to be free of contamination. The engine was examined for operational discrepancies and was found to be capable of producing power. The propeller damage and trees cut by the propeller showed evidence of full power being developed at impact.

The pilot reported that he had taken precautions to avoid spark plug fouling as he taxied out for take-off and had used carburettor heat to prevent the formation of carburettor ice.

A stainless steel aircraft quality control cable had been fastened between the two front bollards of the floats. This provided a means of getting onto the left float from the cabin door, which was on the right side of the aircraft. The cable was found fractured in tensional overload.

The lakes preferred for minnow trapping are small in size and land-locked; this lake was of sufficient length for take-off.

The cause of the power interruption was not determined. When the cable across the floats struck the trees, it arrested the forward motion of the aircraft and caused a downward pitching motion. This motion contributed significantly to the amount of damage to the aircraft and to the risk of injury to the pilot.

FINDINGS:

Cause Related:

1. The aircraft lost altitude because of intermittent power output of the engine.

2. The cause of the intermittent engine power was not determined.

Other:

1. The cable across the floats contributed significantly to the degree of damage incurred and to the risk of injury to the pilot.

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CESSNA A185F SKYWAGON C-FHSQ
WILLIAMS LAKE, BRITISH COLUMBIA
09 MAY 1987

REPORT NUMBER: 87-P70021 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1415 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,600	700
LAST 90 DAYS	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The aircraft was being flown from Springhouse Airpark, British Columbia, where it had been stored over the winter, to Kamloops, British Columbia for its annual maintenance inspection. A stop was made at Williams Lake to refuel, and, after being refuelled, the aircraft taxied out on the lake and began its take-off run. Witnesses reported that the aircraft lifted off the water, then yawed progressively to the left until control was lost; the aircraft then struck the water and cartwheeled. The pilot was unable to escape from the submerged aircraft, and he drowned.

PERTINENT INFORMATION:

The take-off was witnessed by a number of people situated at various locations around Williams Lake. They all stated that the engine remained at full power throughout the take-off run.

Boats arrived at the scene within minutes of the accident, and the aircraft was found floating upside-down with the pilot secured to his seat by a lap belt. The aircraft was equipped with a shoulder harness, but the pilot was not wearing it. The pilot had received minor head injuries in the accident; however, when he was freed from the aircraft, he could not be revived.

The pilot was licensed and experienced on the aircraft type, but he had not flown for six months prior to the accident.

Life-jackets, as required by Air Navigation Order, Series II, Number 8, were not carried on board the aircraft.

Examination of the aircraft after the accident showed that the right aft rudder control cable had become detached from the tail bellcrank assembly; the rudder cable, Cessna part number 0510105-152, was broken at the terminal which fastens it to the bellcrank, and the terminal was still attached to the bellcrank. The attaching bolt had been overtightened, thus preventing pivoting of the terminal on the bellcrank when the rudder was moved. The area was heavily rusted and appeared to have been in that condition for some time.

Laboratory analysis concluded that the right aft rudder cable failure originated inside the sleeve at the bellcrank attachment point. Microscopic analysis of the failed ends of the cable showed mostly flat surfaces for the majority of the wires, indicating a progressive mode of failure. Scanning electron microscopic analysis confirmed that the cable had failed in generally low-cycle fatigue, under multidirectional bending loads. Fatigue had progressed to the extent that failure occurred at normal service loads. Only a few wires failed in overload, and most strands showed some evidence of fatigue.

The aircraft had remained in storage over the winter, and other than checking the fuel system and checking the engine for oil, no extensive pre-flight inspection of the aircraft was carried out.

ANALYSIS:

Because the terminal was unable to pivot on the bellcrank, the angular movement produced when the rudder pedals were moved resulted in a bending moment being applied to the cable where it is attached to the terminal which caused the cable to fail in fatigue. The complete failure of the right rudder cable appears to have taken place just after the aircraft lifted off the water, while the engine was producing maximum power. The sudden relief of forces on the rudder caused the aircraft to yaw to the left to the point where the pilot was unable to control the aircraft.

It is possible that, had the pilot worn the available shoulder harness, he would not have been injured and his chances of survival would have been improved.

FINDINGS:

Cause Related:
1. The overtightened bellcrank terminal led to failure of the right rear rudder cable.

2. After the rudder cable failed, the pilot lost control of the aircraft.

3. The pilot did not wear the shoulder harness that was installed in the aircraft.

Other:
1. Life-jackets, as required by ANO Series II, Number 8, were not carried on board the aircraft.

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DE HAVILLAND DHC-3 OTTER N90627
SELKIRK SEAPLANE BASE, MANITOBA
11 MAY 1987

REPORT NUMBER: 87-C70901 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1245 CDT
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,400	25
LAST 90 DAYS	50	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

SUMMARY REPORT:

The float-equipped aircraft was being ferried from Owen Sound, Ontario to Anchorage, Alaska and had stopped in Selkirk, Manitoba. As the aircraft taxied away from the dock, the engine stopped, and the pilot attempted a restart. During the attempted restart, the engine caught fire, and the crew abandoned the aircraft which then drifted to the shoreline of an island. The fire subsequently subsided, after causing extensive damage.

The engine had been replaced in Owen Sound, and the aircraft had flown 10 hours since then without any problems. After the initial start on the day of the accident, the engine ran for some time at a low speed with a rich mixture and then stopped. During the attempt to restart the engine, the boost pump switch was selected on, and the throttle was pumped in an effort to get the engine to respond; this technique, which is not correct, resulted in the engine becoming flooded with fuel.

The pilot then noticed a smell of burning, and the second pilot saw flames and smoke coming from the engine compartment and the exhaust augmentor tubes. The pilot then closed the mixture lever and opened the throttle in an unsuccessful attempt to clear the engine. When it became apparent that the fire was spreading, the crew pulled the emergency fuel shut-off handle and abandoned the aircraft; they were rescued by a nearby fishing boat.

During the inspection of the engine after the fire, it was found that the magneto boost coil was not connected and that this condition had existed since the replacement engine was installed.

The aircraft was not equipped with an engine compartment fire- extinquishing system, as this is not required by United States Federal Aviation Administration regulations.

The combination of a low engine speed and a rich mixture provided the right conditions to foul the spark plugs with combustion by-products; the fouled plugs then became less efficient and caused the engine to run rough and eventually stop. The booster coil is used to provide a more powerful spark to the plugs during the starting sequence. With the coil not connected, only a weak spark was available, and this was not sufficient to enable the fouled plugs to make the engine fire during the restart attempt. The incorrect throttle technique flooded the engine and caused a vigorous fire when the fuel ignited.

Had a fire extinquisher been installed, the fire could have been arrested quickly and the damage minimized.

FINDINGS:

Cause Related:

1. The spark produced was not sufficient to start the engine because the boost coil had not been connected.

2. The engine flooded and caught fire because of an incorrect starting technique.

Other:

1. The aircraft was not equipped with an engine fire- extinquishing system.

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LAKE LA4-200 BUCCANEER C-GAXB
ST-LAURENT, MANITOBA
14 MAY 1987

REPORT NUMBER: 87-C70023 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2000 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	221	28
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot and passenger departed from a private landing strip for a local recreational flight. Approximately 30 minutes later, the amphibious aircraft was observed flying at low level along the shoreline of the lake, and this continued for the next 20 minutes. The aircraft had just flown around a point of land when it suddenly nosed into the water and disintegrated. Immediate rescue attempts were initiated but were unsuccessful in saving the occupants.

PERTINENT INFORMATION:

This was the pilot's second flight of the year; the first took place two weeks before the accident, and the pilot had flown only 10 hours in the past two years. There was no evidence that pilot incapacitation was a factor.

Several witnesses observed the aircraft flying over the lake at estimated altitudes of 10 to 100 feet above the surface, and some believed that the pilot was intending to land.

The aircraft was recovered from a depth of 15 feet and examined. The tail and nose sections had broken away and were recovered separately. The wing tip and sponson float were missing from the left wing. Approximately five feet of the left wing leading edge structure was pushed back, producing a compression deformation from the leading edge to a point just short of the mid-chord position of the left wing tip. The right wing tip, sponson, and wing tip structure were not damaged. The engine and propeller control cables were unaffected by the impact, and there was no indication of an engine malfunction. The damage to the propeller was consistent with a high speed impact, and the engine rpm gauge showed an impact mark at 2350 rpm.

The weather conditions were excellent with clear skies, good visibility, and calm winds. The calm winds resulted in a smooth, glassy-water surface.

A flock of four birds was observed flying at approximately the same altitude and in the same general area as the aircraft just before the accident; however, no evidence of a bird strike was found in the wreckage.

ANALYSIS:

During the accident flight, the pilot flew the aircraft for a considerable period of time at a low altitude. The damage pattern showed that the left wing tip had struck the water, causing the aircraft to nose down, cartwheel, and disintegrate. It is possible that the glassy-water conditions led the pilot to believe that he was flying at a higher altitude; it is also possible that he was turning the aircraft to avoid the small flock of birds. In any case, the pilot initiated the turn at an altitude that did not provide sufficient clearance from the lake surface.

FINDINGS:

Cause Related:

1. While flying at a low altitude over the glassy-water surface, the pilot commenced a turn at an altitude that resulted in the left wing striking the water.

Other:

-Nil-

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CESSNA 180J SKYWAGON N42401
READ ISLAND, BRITISH COLUMBIA
17 MAY 1987

REPORT NUMBER: 87-P70901 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1230 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	870	870
LAST 90 DAYS	8	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot and his wife were en route to Stuart Island, British Columbia from Seattle, Washington in their float-equipped aircraft. They landed beside Read Island for a rest and anchored the aircraft on the beach. Later, when preparing to depart, the pilot placed the anchor on the left float and pushed the aircraft from the beach. He then started the engine, taxied away from shore, and began the take-off. Just after the aircraft became airborne, the anchor fell off the float and into the water. The aircraft yawed, the left float and wing tip struck the water, and the aircraft nosed over and quickly sank to its floats.

The pilot was able to escape from the submerged aircraft through the left-hand door. He then repeatedly dived underwater in an attempt to rescue his wife but was unable to locate her. She was found by rescuers at the rear of the cabin 20 minutes later but died in hospital several days after the accident.

PERTINENT INFORMATION:

The weather was suitable for the flight. The area was generally sheltered from wind by the island; the winds were light but gusty and variable in direction and strength.

The pilot was medically disqualified from flying at the time of the accident because of a cardiovascular condition; however, the condition was not a factor in the occurrence.

The aircraft log books were lost at sea at the time of the accident. The pilot stated that there were no aircraft deficiencies relevant to the circumstances of the accident. The aircraft's anchor was a wide fluke type and was secured to the aircraft with a one-half inch rope and a one-half inch chain combination. The anchor line was able to withstand forces many times those required to anchor the aircraft securely.

The pilot and his wife were not wearing life-vests, and the aircraft was not equipped with shoulder harnesses. Neither occupant received incapacitating injuries during the crash sequence. The aircraft's emergency locator transmitter (ELT) was inoperative because it was submersed in water.

ANALYSIS:

When the pilot took the anchor from the beach and placed it on the float, he noted that the wind was gusty. He was concerned that the aircraft might weathercock toward the island so he was anxious to get underway to avoid the shore. After he entered the aircraft and started the engine, he forgot that the anchor was on the float. As the anchor was not secure, it fell into the water during the take-off attempt. Because the anchor line did not break when the wide flukes dug into the water, the drag on the left float caused the aircraft to yaw violently. The pilot was unable to react in time to prevent the aircraft from striking the water.

FINDINGS:

Cause Related:
1. The pilot lost control of the aircraft during the take-off attempt when the unstowed anchor fell into the water and caused the aircraft to yaw violently.

Other:
-Nil-

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AERONCA CHAMPION 7AC CF-JMA
ONAPING LAKE, ONTARIO
24 MAY 1987

REPORT NUMBER: 87-O/70037 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1220 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	500	4
LAST 90 DAYS	30	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	1	-

SUMMARY REPORT:

While turning left from downwind to base leg, the aircraft suddenly flicked to the right, and the nose pitched down. The aircraft struck the ground in a nose-down, right-wing-low attitude. The pilot and passenger were seriously injured.

Before the accident, the pilot had successfully completed five take-offs and landings on the lake. The owner of the aircraft, who was sitting in the rear seat, was checking the pilot out on the aircraft type; however, the rear control stick was not installed, and there was only rudder control available.

As the pilot turned from the downwind leg onto base leg, he closed the throttle and entered a steep and uncoordinated turn to the left. The pilot does not recall the events leading up to the accident, but the owner felt the airspeed was decreasing rapidly during the turn. Several witnesses reported seeing the aircraft enter a steep left turn, then flick to the right before striking the ground. The way in which the aircraft flicked to the right is characteristic of a stall-spin sequence.

The weather was not a factor; the wind was from the north at less than 10 knots. When the aircraft was examined after the accident, no mechanical malfunctions were found. There were no shoulder harnesses installed in either the front or rear seat.

The pilot had flown this aircraft only once before, and the accident flight was the first time he had flown the aircraft from the front seat. He had not practised slow flight, stalls, or spins on this aircraft type and therefore was not familiar with the stall characteristics. As a result, he did not recognize the signs of an approaching stall when he allowed the airspeed to decrease during the steep uncoordinated turn. The owner, was not able to effect a recovery from the stall because the rear control stick was not installed.

FINDINGS:

Cause Related:
1. The pilot was not familiar with the stall characteristics of this type of aircraft and, as a result, did not recognize the indications of an approaching stall.

2. The aircraft stalled and the check pilot was unable to effect a recovery from the stall because the control stick in the rear seat was not installed.

Other:
1. The aircraft was not equipped with shoulder harnesses.

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CESSNA A185F SKYWAGON G-GDIP
GANDER, NEWFOUNDLAND
25 MAY 1987

BRIEF NUMBER: 87-A70012 (Accident)
LOCAL TIME: 2023 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,700	1,600
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot of the tail-wheel-equipped aircraft was returning from a local flight and was landing on runway 13. A quartering tail wind from the right was blowing from 260 degrees at 10 knots. After touchdown, the pilot could not maintain directional control, and the aircraft ground looped. The propeller, the left landing gear, and the left wing were damaged.

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AERONCA S7EC (CONV) CF-ETD
REMI LAKE, ONTARIO
29 MAY 1987

REPORT NUMBER: 87-O/70039 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2125 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	201	68
LAST 90 DAYS	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	1	-

SUMMARY REPORT:

The aircraft, carrying the pilot, one passenger, and some supplies, took off from Remi Lake for a weekend fishing trip. On climb-out, at 100 to 200 feet above the surface, the aircraft pitched nose-down and spun into the water. The passenger was rescued, but the pilot drowned before rescuers could free him from the wreckage.

PERTINENT INFORMATION:

The pilot's licence was not endorsed for float plane flying, nor was there any indication that he had received any formal instruction in flying float planes.

The toxicological examination of the pilot's blood and urine revealed a blood-alcohol concentration of 122 milligrams per cent (mg%) and a urine-alcohol concentration of 177 mg%.

The pilot had purchased the floats and installed them on the aircraft himself less than a month before the accident. A modification had also been carried out on the front set of rudder pedals. Neither the installation nor the modification was properly certified in the aircraft log books. No mechanical discrepancies were found that contributed to the accident.

The aircraft weight was at the maximum allowable for take-off, with the centre of gravity slightly (0.1 inch) aft of the rear limit.

The accident occurred between sunset and official darkness, under clear skies, with a light wind, and a temperature of 26 degrees Celsius.

The area of the lake selected for take-off was found to be of suitable length for the operation of this type of aircraft, and there were no obstructions on climb-out. The water surface conditions were also considered suitable for float plane operations.

ANALYSIS:

The modification carried out to the rudder pedals and the installation of the floats on the aircraft were not considered to have contributed to the accident.

The heavily loaded aircraft, with the centre of gravity slightly aft of the rear limit, would have required skillful handling of the flight controls to successfully make a climbing turn at a low altitude. The aircraft stalled most likely when the pilot attempted a left climbing turn to proceed on course to his intended destination, and the aircraft entered the spin at too low an altitude for recovery.

The concentration of alcohol found in the pilot's blood and urine indicate that his ability to fly the aircraft and to make decisions was impaired by alcohol at the time of the accident.

Findings:

Cause Related:

1. The aircraft stalled after take-off from the surface of the lake.

2. The aircraft entered a spin at a low altitude and struck the water.

3. The pilot's ability to fly the aircraft and make decisions was impaired by alcohol at the time of the accident.

Other:

1. The pilot had not received any formal float plane instruction, and his licence was not endorsed for float plane flying.

2. The installations and modifications carried out on the aircraft were not properly certified in the aircraft log books.

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CESSNA 180J SKYWAGON C-FBUR
SHAWNIGAN LAKE, BRITISH COLUMBIA
29 MAY 1987

BRIEF NUMBER: 87-P70031 (Accident)
LOCAL TIME: 1430 PDT
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	94	16
LAST 90 DAYS	22	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was flying circuits at Shawnigan Lake to complete his conversion training for a seaplane endorsement. Four uneventful landings were made into wind on a heading of about 330 degrees magnetic. The pilot, thinking the wind had veered to 040 degrees magnetic, attempted his fifth landing in that direction. However, he had misjudged the wind direction, and, during the ensuing cross-wind landing, the right wing struck the water and was substantially damaged. The aircraft remained upright.

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CESSNA 185A C-FNYI
LAC INTERSECTION, QUÉBEC
05 JUNE 1987

REPORT NUMBER: 87-Q70016 (Accident)
SOURCE OF INFORMATION: Field Investigation
LOCAL TIME: 1815 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS	ALL TYPES	ON TYPE
TOTAL	1,400	800
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The aircraft, which was on its third flight of the day, took off from the southern end of Lac Intersection, Québec with 20 degrees of flap selected. The aircraft was in a climb in a nose-high attitude, at an estimated height of 150 to 200 feet above the lake, when the engine (Continental IO-470-F) backfired and then stopped. Since the aircraft was almost at the other end of the lake, the pilot decided to make an emergency landing to the left, in a wooded area. The aircraft stalled in the trees, and the two occupants were uninjured. The force of the impact was insufficient to activate the emergency locator transmitter.

The weather conditions were favourable for flying. The aircraft weight and centre of gravity were within the prescribed limits, and the tanks contained enough fuel for the flight. The two other flights of the day had proceeded normally. Before each flight, the pilot had drained the fuel system and did not detect any water in the filter at the firewall.

The aircraft had been parked for about six months with the two fuel tanks empty. A 100-hour inspection was carried out before restoring the aircraft to service. During this inspection, the two rubber fuel cells were rinsed with 10 gallons of gasoline, then emptied through the filter at the firewall to eliminate a possible accumulation of water. The aircraft was refuelled, and a test flight to confirm the airworthiness of the aircraft was made on the day before the accident. Drain valves were installed under the aircraft's tanks, in accordance with Airworthiness Directive (AD) 84-10-01, amendment 39-4863.

During the investigation, about 10 ounces of water was drained from the fuel system, in the lower part of the fuselage and under the sump in the cockpit. It was also noted that the inner flexible rubber fuel cells on the two wings showed signs of diagonal wrinkles on the underside. According to AD 84-10-01, amendment 39-4863, either appropriate modifications must be made to remove the diagonal wrinkles at the bottom of the fuel cells or the fuel cells must be replaced. Although this AD had been recorded in the technical log book on four occasions since 08 August 1984, it would appear that this modification had not been done or that it did not comply with the above-mentioned AD.

The diagonal wrinkles at the bottom of the fuel cells allowed water to accumulate, causing the engine to stop because of fuel contamination. The pilot was forced to make an emergency landing in the trees when the engine stopped shortly before the aircraft reached the other end of the lake.

Modification or replacement of the two fuel cells, as required by the Airworthiness Directive, would have made it possible to properly drain the water that had accumulated at the bottom of the cells. The water apparently moved toward the engine when the aircraft climbed in a more excessive nose-up attitude than on the previous two take-offs.

FINDINGS:

Cause Related:

1. The engine stopped because of a large quantity of water which contaminated the fuel system during the climb in a nose-up attitude.

2. The pilot was forced to make an emergency landing in the trees when the engine stopped shortly before the aircraft reached the other end of the lake.

3. The aircraft's tanks, which had large diagonal wrinkles, did not comply with AD 84-10-01. The wrinkles caused water to accumulate in the fuel system.

Other:
- Nil -

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MAULE M-7-235 SUPER ROCKET N5670S
PONHOOK LAKE, NOVA SCOTIA
07 JUNE 1987

REPORT NUMBER: 87-A70901 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1315 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	450	7
LAST 90 DAYS	86	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The amphibious aircraft departed Halifax, Nova Scotia and flew to Ponhook Lake where the pilot intended to practise water landings. The westerly wind was light but variable and gusty around the shoreline and the islands in the lake. The selected landing area was between two islands. After a smooth touchdown, the left wing rose, the right wing tip struck the water, and the aircraft nosed over. In their haste to exit the cabin as the inverted aircraft filled with water, the three occupants initially forgot to unfasten their seat-belts. One passenger was delayed in his escape when he attempted to turn the door handle the wrong way. All three occupants were wearing life-jackets and, after exiting the aircraft, swam to shore.

The pilot had accumulated seven hours of float experience on this aircraft. In the chosen landing area, the aircraft was subjected to variable and gusty wind conditions. After touchdown, a gust of wind lifted the left wing, and the pilot lost control of the aircraft. When the right wing tip struck the water, the aircraft nosed over.

FINDINGS:

Cause Related:

1. The pilot was unable to control the aircraft when a gust of wind lifted the left wing after touchdown.

2. The right wing tip struck the water, causing the aircraft to nose over.

Other:
- Nil -

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CESSNA 172K HAWK SP C-GRZH
THUNDER BAY SEAPLANE BASE, ONTARIO
12 JUNE 1987

REPORT NUMBER: 87-C70033 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1432 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	290	200
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot and two passengers were going on a fishing trip to a remote lake northeast of Thunder Bay. The float-equipped aircraft commenced the take-off from the breakwall toward the harbour shoreline to take advantage of the wind. Normal acceleration was experienced, but the aircraft did not respond when lift-off was attempted. When the pilot reduced power to reject the take-off, the aircraft suddenly became airborne in a gust of wind. The pilot then increased power, and the aircraft began to climb away slowly toward rising terrain. Just beyond the shoreline, the aircraft struck a hydro pole and pitched down, striking the ground and coming to rest in an inverted position. The pilot was seriously injured.

At the time of take-off, the temperature of 26 degrees Celsius and dew point of 15 degrees Celsius produced a density altitude of 2,200 feet; the wind was gusting to 22 knots.

The aircraft was 15 pounds under gross weight, and the centre of gravity was within the prescribed limits. The pilot reported that the aircraft and engine were serviceable.

The distance available for take-off was approximately one mile. The direction of take-off was toward the shore where the terrain rises 400 feet within one mile of the shoreline. Longer take-off distances were available had the pilot proceeded outside the breakwall, or had he made a cross-wind take-off.

The hot, humid day and near maximum weight of the aircraft combined to reduce aircraft performance. This affected the take-off distance required and the rate of climb. When the aircraft did not lift off as expected, the pilot decided to reject the take-off and decrease the power. However, the aircraft became airborne due to a gust of wind, and the pilot reversed his decision and reapplied power. The pilot was then committed to flight, but the rate of climb and the remaining distance were insufficient to allow the aircraft to clear the rising terrain ahead.

CONCLUSIONS:

Findings:
1. Following a rejected take-off, the pilot reversed his decision and reapplied power to continue the take-off.

2. Given the existing conditions of temperature and aircraft weight, the distance remaining after power was reapplied was insufficient to provide obstacle clearance over rising terrain.

Causes:
The pilot attempted a take-off with insufficient distance available under the existing conditions.

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CESSNA A185F SKYWAGON N9707N
FREDERICTON, NEW BRUNSWICK
13 JUNE 1987

REPORT NUMBER: 87-A70902 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1644 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,430	367
LAST 90 DAYS	44	44

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The Cessna 185 on amphibious floats took off from the Fredericton Airport runway for a landing on the nearby river. When the pilot landed the aircraft on the river, the aircraft nosed over and sank with the bottom half of the floats remaining above the water. The pilot escaped from the aircraft, floated to the surface, and was rescued by a boat operator who witnessed the accident.

The pilot did not carry out a pre-landing check prior to landing on the water. During the short flight, he was distracted by abnormal indications of the fuel flow meter and the exhaust gas temperature gauge, and he did not retract the landing gear. As a result, on touchdown, the landing gear dug into the water, and the aircraft nosed over.

FINDINGS:

Cause Related:
1. The pilot was distracted during the short flight and did not carry out a post-take-off or pre-landing check.

2. The pilot did not retract the landing gear before landing on the water.

Other:
-Nil-

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CESSNA 180C C-FMGP
WILKINS LAKE, ONTARIO 1/2 mi NE
20 JUNE 1987

REPORT NUMBER: 87-O/70048 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2000 EDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	140	30
LAST 90 DAYS	40	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

During a 20- to 30-minute flight in the floatplane, the pilot completed a level turn to the right at about 1,000 feet above ground level to fly over a lake. About 15 to 20 seconds later, the engine (Continental O-470-L) suddenly lost all power. Although the pilot immediately selected the fuel valve from the right fuel tank to both fuel tanks, the engine did not restart. A forced approach to land on the lake was attempted, but the aircraft struck some tall trees on final approach and fell vertically into the woods; the impact destroyed the aircraft.

The fuel system in this aircraft consisted of two main wing fuel tanks with single centrally mounted fuel outlets on the inner face of each tank. The total capacity of the fuel system was 65 U.S. gallons or 32.5 U.S. gallons per tank, including about five U.S. gallons of unusable fuel per tank.

The pilot reported that both fuel gauges were indicating one-quarter full when he took off, that is, in each tank, there were about eight U.S. gallons of fuel, of which approximately three gallons were usable. The fuel gauges had a red arc extending from the one-quarter to the empty position.

The amount of unusable fuel increased during uncoordinated flight as there were no baffles in the fuel tanks to prevent the movement of the fuel away from the single tank outlets. In the crash, the right wing and fuel tank were torn from the fuselage, and any fuel remaining in the tank was lost; the fuel lines were found to be empty.

In 1968, because of possible fuel supply interruption, in this type of aircraft, to the engine when the fuel tanks were one-quarter full or less, the Department of Transport issued Notice Number 10/68 to Aircraft Maintenance Engineers and Aircraft Owners (N-AME-AO), which recommended that all Cessna 180 aircraft owner's manuals be amended to include this information. The pilot was unaware of the contents of N-AME-AO, and the aircraft flight manual had not been amended. The Cessna 180C owner's manual warned pilots not to take off if the fuel gauges were indicating in the red arc. In later model Cessna 180 series aircraft, fuel selectors were placarded to indicate both tanks should be selected for all flight attitudes, except level flight.

Examination of the engine following the accident did not reveal any mechanical malfunctions that would have caused the sudden power loss.

When the pilot took off, there were approximately three U.S. gallons of usable fuel in each tank. After flying for about 20 minutes, the pilot made a level turn to the right with the fuel valve selected to the right tank. During the turn, because there was little or no usable fuel remaining in the right tank, the outlet was uncovered, and the fuel supply to the engine was interrupted, resulting in the sudden loss of power. Although the pilot immediately selected the fuel valve to both tanks, there was insufficient altitude, time, or fuel remaining to regain normal engine performance.

FINDINGS:

Cause Related:
1. The engine lost power because of fuel starvation.

2. The pilot took off with insufficient fuel to complete the flight.

3. The pilot was unaware of the contents of N-AME-AO 10/68, and the aircraft flight manual had not been amended.

Other:
-Nil-

SAFETY ACTION:

Action Taken:
As a result of this occurrence, the CASB issued Aviation Safety Advisory No. 75140 suggesting that it may be timely to once again draw to the attention of Cessna 180 owners and operators the existence of N-AME-AO 10/68.

In response to this advisory, Transport Canada issued Service Difficulty Advisory No. AV-88-01 which strongly recommends the placarding of the Fuel Selector Valve to instruct that the valve should be set at the

BOTH ON position when the aircraft is operated in any attitude other than level flight.

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PIPER PA-18A SUPER CUB C-FCJT
EAGLE BAY, BRITISH COLUMBIA
20 JUNE 1987

REPORT NUMBER: 87-P70039 (Accident)
INFORMATION SOURCE: Field investigation
LOCAL TIME: Unknown
OPERATION: Private Recreational
DAMAGE: Unknown
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,395	2,387
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot and one passenger departed from Eagle Bay, British Columbia for a flight to McDougal Lake, British Columbia, a distance of about 90 miles to the north-northwest; the purpose of the flight was for sport fishing, and they planned to return that evening. When they did not return, Search and Rescue was notified, and an extensive air search was conducted. The search failed to find the aircraft.

PERTINENT INFORMATION:

The pilot, age 71, held Canadian and U.S. private pilot licences. In 1978, he was assessed as medically unfit in Canada due to an abnormal electrocardiogram (ECG) tracing. Re-examinations were carried out from time to time over the next nine years, but he was still assessed as unfit to hold a private pilot licence. In 1979, the Canadian Medical Advisory Panel reviewed his case and assessed him as unfit. In 1983, he undertook further examinations, and the reports showed elevated blood pressure. In 1986, another ECG was abnormal. The most recent Canadian medical examination performed in 1987 found him to be medically unfit. The Canadian Medical Advisory Panel cardiologist requested additional tests, but none had been received.

The pilot's U.S. private pilot licence was renewed in 1981, 1984, 1985, 1986, and 1987; a Federal Aviation Administration (FAA) Third Class Medical Certificate was issued on 10 April 1987, and no disabilities were noted by the medical examiner. The loss of his Canadian licence and the medical conditions which caused it were not reported by the pilot to the U.S. medical examiner.

Examination of the Aircraft Log Books did not reveal any problems with the aircraft. The aircraft maintenance engineer who serviced the aircraft stated that it was kept in good condition. The aircraft was due for its annual inspection in the week following the disappearance. Since no one observed the departure of the aircraft, it could not be determined how much fuel was on board or what equipment was carried. It is not known if the pilot checked the weather before departing.

When the aircraft departed, the weather was good. The weather forecast for the route and destination indicated that visual flight rules (VFR) conditions would prevail in the morning but that a front would pass through the area during the day, resulting in cumulus clouds and producing strong winds at the lower levels. The clouds were forecast to increase during the day, and the ceiling was forecast to lower to 1,500 to 2,000 feet above sea level (asl) in showers and thundershowers, with the visibility reduced to as low as one mile in these showers. The increased thunderstorm activity would produce turbulence and lightning. The aftercast showed that the weather was as forecast.

The British Columbia Forest Service records lightning strikes by remote sensors located throughout all forested areas of the province; during the period from noon to midnight on 20 June 1987, numerous lightning strikes were recorded along the intended route of the aircraft. The aircraft was equipped with a Narco 10 emergency locator transmitter (ELT), but no ELT signal was detected after the disappearance of the aircraft.

ANALYSIS:

It is unlikely that the weather was a problem on the outbound flight; however, the aircraft would have passed through showers and thundershowers on the return trip, which could have seriously reduced visibility. A straight-line route for the return trip would have taken the aircraft over rugged mountains, and there would have been considerable turbulence from the strong winds.

It is also possible that the pilot became incapacitated, as he had a history of abnormal ECGs for at least nine years. However, as the aircraft has not been found, the investigation could not be completed, and it is not possible to determine the cause of the accident.

CONCLUSIONS:

Findings:

1. Due to abnormal ECG readings and high blood pressure, the pilot was assessed as medically unfit to hold a Canadian Private Pilot Licence for the nine years preceding the accident.

2. The pilot held a valid U.S. Private Pilot Licence at the time of the occurrence.

3. The aircraft was equipped with an ELT, but no signal was received after the aircraft disappeared.

4. The weather forecast along the planned return route included low visibility and turbulence.

Causes:

As the aircraft was missing at the time of writing, it was not possible to complete the investigation and determine the cause of this accident.

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CESSNA 170B C-FYOB
CHICOUTIMI RIVER, QUÉBEC
21 JUNE 1986

BRIEF NUMBER: 87-Q70021 (Accident)
LOCAL TIME: 1709 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	528	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot, accompanied by a passenger, was making a recreational flight with the intention of making a touch-and-go landing in a westerly direction on the river. The winds were blowing from the west at approximately five knots. The surface of the river was glassy, and the pilot had the setting sun behing him. On final approach, the pilot was blinded by the sun and could not judge his altitude above the river. The airplane hit the water before nosing over and capsizing. The aircraft sustained substantial damages. The pilot and his passenger sustained minor injuries.

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CESSNA 180H SKYWAGON C-FSXN
FORT RESOLUTION,
NORTHWEST TERRITORIES 17 mi SW
23 JUNE 1987

REPORT NUMBER: 87-W70040 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1200 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	805	100
LAST 90 DAYS	130	82

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot, accompanied by two passengers, was flying the float- equipped aircraft from a fishing lodge on Great Slave Lake to Hay River, Northwest Territories. Deteriorating weather was encountered en route, and the pilot descended to keep the shoreline in sight. The aircraft was passing over an island, just above the treetops, when it stalled, rolled, and struck the trees; it then nosed down into the swampy ground. The occupants received minor injuries.

A low pressure system moving through the area was centred just south of Great Slave Lake at the time of the accident. Weather associated with the system was forecast to produce ceilings of 200 to 500 feet and visibilities reduced to one-quarter mile in fog. At the fishing lodge from which the flight departed, there were no communication facilities available to receive weather information, and the pilot had to call Yellowknife while en route to Hay River to obtain the forecast and the latest weather reports.

The pilot had made two previous attempts to reach Hay River over a two-day period but had returned to the fishing lodge after receiving Hay River actual weather reports and forecast weather conditions. During the accident flight, the current forecast for Hay River was for conditions to improve to a 1,500-foot broken ceiling with a visibility of more than six miles by the time the flight was expected to arrive.

The passengers described weather conditions during the flight as turbulent and rainy, with the cloud base near tree-top height. The pilot indicated that he could not recall the last few minutes of the accident flight.

There were no mechanical discrepancies found during examination of the wreckage. The aircraft was not fitted with shoulder harnesses, and, during the impact sequence, the pilot received facial lacerations and was rendered unconscious. The emergency locator transmitter (ELT) functioned and was instrumental in locating the survivors.

The forecast for weather conditions at Hay River to improve to above visual flight minimums would have encouraged the pilot to continue the flight in spite of marginal weather encountered en route. When cloud bases at near tree-top height were encountered, visual contact with the ground was lost, and the pilot lost control of the aircraft which then stalled, rolled, and crashed into the ground.

FINDINGS:

Cause Related:

1. The pilot continued the visual flight into adverse weather conditions.

2. The pilot lost control of the aircraft which then stalled and crashed into the ground.

Other:

1. Injuries to the occupants may have been reduced had shoulder harnesses been available and worn.

2. The ELT was effective in the rescue of the occupants.

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CESSNA A185E SKYWAGON C-FEKQ
EUTSUK LAKE, BRITISH COLUMBIA
03 JULY 1987

BRIEF NUMBER: 87-P70045 (Accident)
LOCAL TIME: 1600 PDT
OPERATION: Private Recreational
DAMAGE: N/A
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	310
LAST 90 DAYS	N/A	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	3

REPORTED CIRCUMSTANCES:

The pilot and three passengers were taking off from Eutsuk Lake, British Columbia. During the take-off run, the aircraft turned uncontrollably to the right, and the pilot could not keep the right wing up. The pilot rejected the take-off, and, while returning to the shore, the aircraft sank. All occupants escaped without injury. The aircraft has not been retrieved, but the pilot believes that the right float had filled with water either when the float ruptured or when one of several bottom patches on the bottom of the float failed.

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CESSNA A185E CF-UIV
BURLINGTON BAY, ONTARIO
09 JULY 1987

REPORT NUMBER: 87-O70053 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1430 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,610	160
LAST 90 DAYS	60	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The amphibious aircraft departed from a paved runway in Waterdown, Ontario, on a pleasure flight to Burlington Bay, Ontario. The pilot was intending to demonstrate a water landing on the bay to his passengers. When the aircraft touched down on the water, it immediately flipped over and sank; only the floats remained on the surface. The pilot and the passenger in the rear seat escaped from the aircraft, but the front-seat passenger, who was a non-swimmer, remained inside; he was rescued by the pilot. A nearby boat rescued the occupants about five minutes after the accident.

The aircraft was equipped with amphibious floats. Indicator lights in the cockpit indicate the position of the landing gear wheels; a white light indicates wheels retracted, a green light indicates wheels extended, and a red light indicates that the gear is in transit. The green light was illuminated throughout the flight.

The rear-seat passenger was wearing a non-inflatable life-jacket; air regulations state that non-inflatable life-jackets are not approved.

During the approach, the pilot was involved in a conversation with one of the passengers and was distracted from completing the pre-landing check which he normally did from memory.

The pilot did not select the landing gear up after take-off, and, because he did not complete the pre-landing check, he omitted to retract the gear before landing on the water; as a result, the aircraft flipped over and sank.

FINDINGS:

Cause Related:

1. The landing gear was not raised after take-off.

2. The pilot's attention was distracted, and he did not complete the pre-landing check.

3. The pilot landed the aircraft on water, with the wheels down.

4. The aircraft immediately flipped over when the wheels contacted the water.

Other:

1. The passenger in the rear seat was wearing a non-approved, non-inflatable type of life-jacket.

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SPENCER AIR CAR N17WH
GODS LAKE NARROWS, MANITOBA
10 JULY 1987

BRIEF NUMBER: 87-C70904 (Accident)
LOCAL TIME: 1445 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,200	100
LAST 90 DAYS	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The aircraft was returning from a local flight. The pilot rushed his approach because another aircraft, which was in an emergency situation, was to land soon in the opposite direction. There was a 15- to 20-knot cross-wind about 50 degrees off the runway heading. On short final, the aircraft began to sink. Power was applied, but the descent continued, and the aircraft made a hard landing just short of the gravel runway.

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BELLANCA 7ECA CHAMPION C-FTEW
LAC BOISVERT, QUÉBEC
17 JULY 1987

REPORT NUMBER: 87-Q70028 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1810 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	190	120
LAST 90 DAYS	40	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	1

HISTORY OF THE FLIGHT:

The float-equipped aircraft, with two persons on board, took off to the south from Lac Boisvert, bound for a neighbouring lake. At an altitude of about 1,000 feet above ground level, the pilot made a climbing turn to the left. During the turn, the aircraft encountered a gust of wind and suddenly rolled, banking 90 degrees, and lost altitude. The pilot regained control of the aircraft and raised the aircraft nose to avoid trees on an island ahead. The aircraft nosed down, crashed into the water, and sank immediately. The passenger was able to evacuate the aircraft uninjured; the pilot, who was seriously injured, drowned.

PERTINENT INFORMATION:

A front was passing through the region. Winds were from the southwest at 10 to 15 knots gusting to 35 knots. The pilot had waited all day for the sky to clear before taking off. Lac Boisvert is bordered with trees, and there is an island almost in the centre of the lake.

According to witnesses, the aircraft appeared to be operating normally. Examination after the accident did not reveal any technical malfunctions that might have contributed to the accident. The weight and centre of gravity of the aircraft were within the prescribed limits. The pilot was qualified for the type of flight undertaken.

The aircraft was not equipped with shoulder harnesses. On impact, the pilot struck the instrument panel and was seriously injured. He was not able to evacuate the aircraft and drowned.

During the climbing turn, the aircraft encountered a gust of wind. According to the passenger, the aircraft was perpendicular to the horizon and began to lose altitude. The pilot regained control of the aircraft at low altitude over the surface of the water. When the pilot noticed the trees on the island ahead of him, he immediately raised the aircraft nose; the aircraft then stalled and dived nose-down.

ANALYSIS:

When the aircraft encountered the gust of wind, one wing dropped, and the aircraft lost altitude. The pilot managed to overcome this temporary loss of control. However, when he raised the nose of the aircraft to avoid the trees on the island, the aircraft stalled. Since the aircraft was at a low altitude over the lake, the pilot was unable to recover in time, and the aircraft nosed down and sank. Because there were no shoulder harnesses, the pilot struck the instrument panel, and he drowned.

FINDINGS:

Cause Related:

1. During a turn, one wing dropped, and the aircraft lost altitude when it encountered a gust of wind.

2. The aircraft stalled when the pilot raised the nose of the aircraft to avoid the trees ahead.

3. The stall occurred at too low an altitude to effect a recovery.

4. Because there were no safety harnesses, the pilot suffered injuries which prevented him from evacuating the aircraft.

Other:

-Nil-

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LAKE LA-4-200 C-GXKT
LAC GRAND MESNIL, QUÉBEC
18 JULY 1987

BRIEF NUMBER: 87-Q70030 (Accident)
LOCAL TIME: 1030 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Priate

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,200	400
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot of the amphibious aircraft was on a recreational flight from Baie-Comeau to Lac Grand Mesnil, Québec. The area selected for landing was surrounded by mountains and hills, and the wind was from the east at five knots and gusting. The pilot landed in a narrow pass on the lake, heading north. On touchdown, a gust of wind caused the left wing tip and float to touch the water at the same time as the hull touched down. The left float separated from the aircraft. The aircraft then swerved and slid to the right, causing the right wing tip and its float to enter the water. The right float also separated. The pilot managed to taxi to shore, and the two occupants escaped injury. The aircraft sustained substantial damage.

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CESSNA 180 SKYWAGON C-FJDJ
TAZIN LAKE, SASKATCHEWAN
18 JULY 1987

BRIEF NUMBER: 87-C70056 (Accident)
LOCAL TIME: 1530 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,500	1,500
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was on final approach for a water landing in gusty wind conditions. Just prior to touchdown, the aircraft encountered a downdraft, and the pilot was unable to prevent a hard landing. The propeller holed both floats, and the aircraft slowly nosed over as the floats filled with water.

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CESSNA 180 SKYWAGON CF-XLR
MELFORT, SASKATCHEWAN
19 JULY 1987

BRIEF NUMBER: 87-C70055 (Accident)
LOCAL TIME: 1620 CDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,810	450
LAST 90 DAYS	25	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

REPORTED CIRCUMSTANCES:

The pilot, with two passengers on board, was doing circuits from a small lake adjacent to the Melfort Airport. Shortly after take-off following a touch-and-go landing, the floats struck slightly rising terrain at the end of the lake. The aircraft became airborne for a distance of about 150 feet then touched down again. The aircraft decelerated quickly then nosed over. The pilot noted that the wind direction had changed between take-offs, resulting in a downwind component for the last touch-and-go landing. There were heavy rain showers in the area.

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CESSNA A185F SKYWAGON C-GYWJ
RAE LAKE, NORTHWEST TERRITORIES
22 JULY 1987

REPORT NUMBER: 87-W70050 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2000 MDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,500	1,300
LAST 90 DAYS	100	80

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

SUMMARY REPORT:

The pilot and two passengers departed the Yellowknife, Northwest Territories Airport in the amphibious float-equipped aircraft, on a flight to Rae Lake, Northwest Territories. Upon arrival, the pilot confirmed that the wheels were up by checking the position indicator on top of the left float. When the aircraft touched down on the water, it yawed sharply to the right. The left wing dug into the water, and the aircraft nosed over and came to a stop suspended in the water by the floats. The pilot and both passengers were rescued by local residents.

Several witnesses had noticed that the right main and bow landing gear were extended as the aircraft approached for a landing, but they had no radio and were therefore unable to advise the pilot. The aircraft was equipped with electric landing gear position lights; however, this indicator system was unserviceable. The pilot did not check the gear position indicator on top of the right float and did not ask either of the passengers to do so.

The post-crash inspection revealed that the left landing gear was up and locked, the right landing gear was down and locked, and the gear selector handle was in the gear-up position.

Further examination revealed that a retaining cotter pin and washer were not in position on a flathead connecting pin between the hydraulic cylinder and the retracting cable assembly in the right float. The retracting cable was found slack and disconnected from the hydraulic cylinder. The cotter pin, washer, and flathead pin were found in the bottom of the float compartment. An internal inspection of the floats showed that the electrical terminals and connectors of the gear position warning circuit were corroded. The pilot had operated the aircraft for approximately 37 flying hours without the benefit of the gear warning lights.

The landing gear retraction cable was reattached to the hydraulic cylinder using the flathead pin, the cotter pin, and the washer found in the bottom of the float compartment, and, when the landing gear was selected up, the gear operated normally. An examination of the cotter pin showed that one leg had broken off torsionally, while the other leg showed multiple bends, indicating that it had been used on more than one occasion. The Federal Aviation Administration (FAA) Aircraft Inspection and Repair Manual (AC 43.13-14), the use of which is recommended by Transport Canada, states that a cotter pin should be used only once. It was also discovered that the bending of the unbroken cotter pin leg was insufficient to prevent the pin from falling out of the hole in the flathead pin.

Because the aircraft was landed with the right gear extended, the drag forces caused the aircraft to yaw and nose over.

CONCLUSIONS

Findings:

1. The aircraft was landed on the water with the right gear extended.

2. The pilot did not visually check that the right landing gear mechanical indicator was in the gear-up position.

3. The landing gear retraction cable was disconnected from the hydraulic retraction actuator.

4. The cotter pin used to lock the retraction cable to the retraction actuator was broken and had been reused.

5. The electrical landing gear position indicator lights were unserviceable and had been so for approximately 37 flying hours.

Causes:

The broken and improperly installed cotter pin allowed the flathead pin that connects the gear retraction cable to the hydraulic cylinder to fall out and disconnect the right main and bow landing gear from the retraction system. The pilot did not confirm that the right landing gear was retracted prior to the landing.

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GOVERNMENT OF NEWFOUNDLAND
CANADIAN VICKERS LTD. 28-5ACF CANSO
C-FCRP
GANDER, NEWFOUNDLAND
06 MAY 1987

REPORT NUMBER: 87-A70010 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2120 NDT
OPERATION: State
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	9,000	1,700	400	80
LAST 90 DAYS	3	3	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The aircraft was engaged in water bombing a forest fire located near the threshold of runway 22 at Gander Airport. The aircraft was over the airport at an altitude of 200 feet above ground level (agl) en route to the fire with the fifth load, when the left engine (Pratt and Whitney R-1830-92) started to run rough and lose power. The captain continued to the fire, dropped the load, and turned for a landing on runway 31. After landing and carrying out a 180-degree turn, the captain leaned the mixture on the left engine to try to smooth it out, but it stopped. The captain continued taxiing to the Forestry Department ramp using the brakes for steering. After turning onto the ramp, the captain let the aircraft roll under its own momentum approximately half-way across the ramp. When he applied the brakes again to turn the aircraft, they did not respond. At this time, the co-pilot also applied brakes, but the aircraft continued straight ahead toward the edge of the ramp without any braking action. When the captain realized that the aircraft would not turn or stop, he shut down the right engine. The aircraft struck an auxiliary power cart at the edge of the ramp, rolled down a slope into a ditch, and the nose gear broke off when it struck the ramp access road. The aircraft swung 15 degrees to the left and came to rest with the right wing 24 feet from the Forestry Department building.

PERTINENT INFORMATION:

The pilot reported that the brakes first lost their effectiveness on the ramp, at which time, he observed that the hydraulic pressure was still within the normal limits at 800 pounds per square inch (psi). When the aircraft came to rest, the co-pilot noted that the hydraulic pressure gauge was reading zero. The auxiliary hydraulic pump had not been turned on.

The company procedure for an aircraft with only one engine operating is to shut down on the runway and tow the aircraft back to the ramp; this procedure is not written down in the company operations manual.

The pilot decided to taxi the aircraft to the ramp on one engine because the fire was near the town, and he wanted the aircraft repaired as soon as possible. The co-pilot and the two aircraft maintenance engineers who witnessed the accident considered the captain was taxiing the aircraft too fast. The aircraft was travelling 15 to 20 mph when it struck the ramp access road.

The entrance to the forestry ramp has a 2.4 per cent downslope, and the ramp has a 0.93 per cent downslope.

The weather was clear, and the runway and ramp were dry. The wind was 210 degrees magnetic at 12 knots, giving the aircraft a tail wind as it crossed the ramp.

An examination of the hydraulic system did not show any faults, and an operational check carried out on the brakes found that they were functioning normally. Examination of the brake assemblies revealed that they had been subjected to overheating.

Examination of the engine found that the hold-down studs for the number two cylinder were broken off and that the piston skirt below the oil scraper ring was missing. Laboratory analysis of the failed parts determined that the failure of the hold-down studs was progressive and was due to fatigue pre-cracking. Once the studs failed and released the cylinder from the crankcase, the scraper ring was allowed to expand below the cylinder skirt. The subsequent piston stroke caused the bottom portion of the piston skirt to fail in overload.

The main hydraulic system pressure on this aircraft is normally 1050 psi, with a green arc on the gauge from 800 and 1200 psi. This pressure is produced by an engine-driven hydraulic pump on the right engine or by an electrically driven auxiliary hydraulic pump. The brake system hydraulic pressure is taken off the main system through the brake valve. There is an accumulator in the system to supply brake pressure in the event of a main system failure; there are two debooster valves (one for each brake assembly) to reduce main system pressure to 200 psi.

ANALYSIS:

The cylinder hold-down studs for the number two cylinder failed as a result of fatigue cracking. The cause of the fatigue pre-cracking of the studs could not be determined, but the condition of the washer and the contact surfaces suggested that either the cylinder hold-down nuts were not tightened properly or they became loose during service.

At the time when braking action was first lost on the ramp, the main system hydraulic pressure was down to minimum normal level because the right engine was at idle power and a brake application had just been made. Had the auxiliary pump been turned on, system pressure would have been at the normal level of 1,050 psi; however, even with system pressure at the minimum normal level of 800 psi, there was enough pressure to operate the brakes, as they only required 200 psi. The fact that the brakes lost their effectiveness when the hydraulic pressure was still within the normal range at 800 psi indicates that the loss of effectiveness was caused by overheating, not by a loss of hydraulic pressure.

The company policy of not taxiing the aircraft on one engine is not a written policy as it is felt that it is general knowledge, having been practised for many years. Once the captain had made the decision to taxi, had he taxied the aircraft at a slower speed, the brakes would not have heated to such a degree. Also, had the auxiliary pump been turned on, the main system pressure would have been maintained after the right engine was shut down. The downslope on the ramp and the tail wind increased the speed of the aircraft when it was allowed to roll under its own momentum across the ramp.

CONCLUSIONS:

Findings:

1. The cylinder hold-down studs for the number two cylinder failed because of fatigue cracking.

2. The failure of the piston skirt was a result of overload and was secondary to the release of the cylinder.

3. The captain taxied the aircraft to the maintenance facility on one engine, contrary to an unwritten company policy, because he felt that it was urgent to have the aircraft repaired quickly so he could return to fight the fire.

4. The captain taxied the aircraft too fast, resulting in the brakes becoming overheated and ineffective.

5. The downslope on the ramp combined with the tail wind increased the aircraft speed as it crossed the ramp.

Causes:
The engine power loss occurred because the cylinder hold-down studs failed as a result of fatigue cracking. After landing, the captain taxied the aircraft on one engine at too great a speed, which resulted in the brakes becoming overheated and ineffective.

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GOVERNMENT OF QUÉBEC
CONSOLIDATED VULTEE
PBY5-A CANSO C-FPQP
LAC CACHÉ, QUÉBEC
18 JULY 1987

REPORT NUMBER: 87-Q70029 (Accident)
DAMAGE: Substantial

	Captain	Co-Pilot
Pilot Licence	Airline Transport	Airline Transport
Total Flying Time	9,005 hr	6,551 hr
Total on Type	1,252 hr	549 hr
Total Last 90 Days	25 hr	65 hr

Injuries:	Crew	Passengers	Others	Total
Fatal	1	-	-	1
Serious	-	-	-	-
Minor/None	1	-	-	1
Total	2	-	-	2

HISTORY OF THE FLIGHT:

The aircraft took off from Chibougamau/Chapais Airport, for a training flight with two crew members and proceeded to adjacent Lac Caché. Following an airborne inspection of the lake surface to ensure its suitability, the crew carried out two touch-and-go landings. During the third touch-and-go exercise, the aircraft was observed to nose down into the water. The captain was projected without serious injury from the aircraft which subsequently sank in 20 feet of water, and the co-pilot drowned.

PERTINENT INFORMATION:

Several individuals witnessed the accident. Two witnesses, located approximately 1,500 feet from the accident, had a side view of the occurrence. They both reported that the aircraft made a normal touchdown and rebounded into the air. On the second touchdown, the aircraft contacted the water in a nose-up attitude, with the aft portion of the hull touching the water. The aircraft then bounced again in a much more pronounced manner, before finally diving and striking the water in a marked nose-down attitude. There was a great splash, and water passed over the wings. When the splash subsided, the aircaft was sinking nose-low in the water. The captain was seen shortly thereafter, climbing onto the detached wing and looking into the water for the co-pilot.

The captain stated that all cockpit checks for the touch-and-go exercise had been carried out prior to touching down on the water. According to the captain, the approach was normal, and the airspeed was maintained within the prescribed limits set out by the manufacturer. The initial landing was normal, with the power reduced to idle on both engines. During the landing, the aircraft bounced slightly, and the pilot corrected by levelling the aircraft. When the aircraft touched down again, it came to a sudden stop. The pilot's next recollection was that of being in the water, still secured to his seat.

The crew had been trained on the Canso aircraft, in accordance with the regulations published by Transports Québec, and both crew members were considered proficient. Each spring, crew members are given refresher training which includes porpoise recovery techniques. A porpoise is an unstable pitch oscillation which results from landing at too high or too low an airspeed. The proper recovery technique from a porpoise is either to initiate a missed approach or to maintain a level attitude. Failure to maintain a level attitude will aggravate the porpoising motion.

ANALYSIS:

The captain was trained and qualified in accordance with Transports Québec regulations. Included in his training were the techniques and methods used to arrest any aircraft porpoising tendencies. The observed landing manoeuvres correspond to a porpoise and indicate that the captain did not apply the recommended recovery techniques, allowing the aircraft to continue its unstable porpoising oscillation until it nosed down into the water. The speed and attitude at which the aircraft struck the water resulted in catastrophic airframe damage; there was no indication of any aircraft structural deficiency.

CONCLUSIONS:

Findings:
1. The captain allowed the aircraft to enter a bounce following touchdown and did not apply the recommended recovery technique.

2. During the bounce, the aircraft struck the water in such a manner that the airframe broke up.

3. The flight crew were licensed according to regulations and were trained for recovery from a porpoising motion.

4. There was no evidence found of any airframe failure or system malfunction prior to or during the flight.

5. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

6. The aircraft weight and centre of gravity were within the prescribed limits.

7. Transports Québec regulations did not require that shoulder harnesses be worn by flight crew.

8. Transports Québec regulations did not require that aircrew wear head-protection gear during operational or training flights related to water bombing.

9. There are no regulations requiring aircrew to wear life-jackets during operational flights or during training flights on the water.

Causes:
The captain allowed the aircraft to bounce during touchdown and did not apply the recommended recovery technique.

SAFETY ACTION:

Action Taken:
In its study on "The Carriage and Use of Overwater Life-Support Equipment in Canada" (CASB 88-SP001), the Canadian Aviation Safety Board determined that it is essential that as much as possible be done prior to flight to ensure the survival of the aircraft occupants in the event of a water-contact accident. The Board believes that the non-availability of life-jackets contributes to a high fatality rate, and the best way to ensure an availability is to wear such equipment during the time of highest risk. As such, the Board recommended that:

The Department of Transport evaluate existing personal flotation devices to determine their suitability for use in aircraft ... with a view to making the wearing of such devices mandatory in floatplanes and amphibians when taxiing, landing on, or taking off from water.

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HELIMAX LTD.
HUGHES 369D (Helicopter) C-GAKF
MANIWAKI, QUÉBEC
01 APRIL 1987

BRIEF NUMBER: 87-Q70006 (Accident)
LOCAL TIME: 1320 EDT
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,300	3,150
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

Departing from the company's helipad, the pilot made a vertical take-off to a height of approximately 50 feet and proceeded to a refuelling station situated 600 feet to the north. Nearing destination, while at low altitude and with forward speed, the pilot attempted a quick stop. During the manoeuvre, the tail section of the helicopter contacted the snow- and ice-covered surface heavily, and the aircraft landed on its skids. Damage was limited to the tail rotor, its gearbox and shaft. No one was injured.

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MIDWEST HELICOPTERS LTD.
BELL 204 (Helicopter) C-FRSR
PICKLE LAKE, ONTARIO 24 mi S
05 APRIL 1987

BRIEF NUMBER: 87-C70016 (Accident)
LOCAL TIME: 1740 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,800	650
LAST 90 DAYS	100	40

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The helicopter was being used to move equipment from a trailer to a clearing prior to commencing slinging operations to the final destination. The second load was moved to the clearing and was released before the full weight of the load was on the ground. A rapid climb resulted, and the pilot lowered the collective to arrest the ascent. The helicopter began vertical oscillations, and control inputs were made to move the machine away from the cargo. The oscillations decreased, then increased in amplitude, and the helicopter pitched nose-up to the point that the tail stinger struck the ground. This action restored the machine to the level attitude, but once again it began to climb. The pilot lowered the collective and a hard landing resulted.

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MUSKEGO AIR SERVICE
CESSNA U206F STATIONAIR C-GEIF
CROSS LAKE AIRPORT, MANITOBA
11 APRIL 1987

REPORT NUMBER: 87-C74019 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0900 CDT
OPERATION: Charter
DAMAGE: Minor
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,000	300
LAST 90 DAYS	60	-

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

As the pilot prepared for landing at Cross Lake Airport, Manitoba, the engine started to run rough, and there was a smell of smoke in the cockpit. The pilot selected the master switch off, landed immediately, and shut down the engine. An inspection of the aircraft revealed fire damage to the engine and engine cowlings.

The cylinders for this engine (Continental I0-520-F-9) are produced by threading an aluminum alloy head onto a steel barrel, using thermal differential to produce a friction fit. When cylinders are chromed during the overhaul process, a caustic solution is used which can result in corrosion to the cylinder head threads. A rebuilt cylinder assembly had been installed on this engine, at the number four position, and had accumulated 278 hours prior to the occurrence.

An examination of the engine revealed that the head of the number four cylinder had separated from the barrel and that the internal threads on the cylinder head were corroded. The fuel pressure line between the distributor and the injector was broken off at the injector end.

Corrosion of the cylinder head threads, probably caused by a caustic solution used during the chroming process, had weakened the friction fit holding the cylinder head to the barrel. This caused the cylinder head to separate from the barrel, and the fuel delivery line to the fuel injector was sheared in the process, allowing fuel to spray into the engine compartment and catch fire.

CONCLUSIONS:

Findings:

1. The internal threads on the number four cylinder head were corroded.

2. The corrosion was probably caused by a caustic solution used during the cylinder chroming process.

3. The corrosion caused the cylinder head to separate from the barrel, shearing a fuel pressure line in the process.

4. Fuel was sprayed from the fractured line into the engine compartment, where it ignited.

Causes:
The probable cause of the occurrence was improper use of a caustic solution during the cylinder cleaning process.

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INLAND HELICOPTERS LTD.
HUGHES 269C (Helicopter) C-GRAI
GAMBIER ISLAND, BRITISH COLUMBIA
16 APRIL 1987

BRIEF NUMBER: 87-P70017 (Accident)
LOCAL TIME: 1500 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,500	2,500
LAST 90 DAYS	150	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The helicopter was flown to Gambier Island to inspect log booms anchored there. The pilot landed on a boom and dropped off the crew. Because of a strong gusty tail wind, the pilot decided to move the helicopter forward to a better site. As the helicopter moved forward, the pilot counted the logs under the helicopter to ensure that the helicopter's skid heels would be on a log; however, he landed with the helicopter's right skid heel on a log butt. As power was reduced, the log butt slowly sank because it was unable to support the weight of the helicopter. The tail rotor struck a log, and the tail rotor blades, driveshaft, and gear box were damaged.

The slow change in the helicopter's attitude was not noticed by the pilot until the tail rotor struck the log.

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RANGER HELICOPTERS CANADA
BELL 206B JETRANGER II (Helicopter) C-GGOZ
MOBERT, ONTARIO 5 mi SW
24 APRIL 1987

REPORT NUMBER: 87-O70028
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0930 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	216	120
LAST 90 DAYS	20	18

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	2

HISTORY OF THE FLIGHT:

The pilot and passengers flew to an isolated lake where the front-seat passenger disembarked. As the pilot prepared to depart, he observed the rear-seat passenger also get out of the helicopter to change seats and simultaneously heard a loud grinding noise from the transmission area. The pilot, concerned that the helicopter may have sunk in the mud causing a tail rotor strike, shut the engine down after blade flapping and mast bumping occurred.

PERTINENT INFORMATION:

The landing zone selected by the pilot was an open, muddy, grass-covered area along the lakeshore. After landing, the pilot kept the helicopter light on the landing gear, with the right skid gear in full contact with the ground, but with only the front portion of the left skid gear on the ground. Some forward cyclic control was also required to keep the helicopter level.

The passengers did not have head-sets on, and the pilot visually signalled to the left front-seat passenger that it was all right for him to get out of the helicopter. He was unaware that the left rear-seat passenger was also getting out of the helicopter until he saw this passenger move in his peripheral vision. The pilot reported that, while he was observing the front-seat passenger moving clear of the area and the rear-seat passenger changing seats, he heard a loud grinding noise. Although the pilot attempted to hold the helicopter stationary as the grinding noise continued, rotor blade flapping, mast bumping, and severe cyclic feedback occurred, and the pilot shut down the helicopter.

Inspection of the helicopter revealed that the main input drive shaft, between the engine and transmission, was disconnected from the transmission at the outer spline coupling. The coupling and drive shaft had struck the isolation mount while still connected to the transmission. The coupling, drive shaft, and isolation mount were all damaged.

The transmission drag link, attached to the bottom aft portion of the transmission housing and isolation mount, was bent and pulled off the transmission housing. The main rotor mast was bent above the static stops. The entire helicopter power drive train rotated without any restriction or grinding.

ANALYSIS:

When the helicopter landed, some up collective and forward cyclic were required to keep the helicopter level with the aft portion of the left skid gear clear of the ground. The source of the grinding noise was the main input drive shaft and coupling coming into contact with the isolation mount. The gouge marks in the isolation mount indicate that the drive train was intact when this occurred, and, therefore, the transmission first had to be displaced rearward and downward beyond normal control limits for this to happen.

Although the pilot did not notice the helicopter shift as the passengers departed the helicopter, he was concerned that the helicopter may have sunk in the soft, muddy, uneven landing area. In addition, as his attention was drawn to the left rear-seat passenger's movement, the forward cyclic control limits were inadvertently exceeded, resulting in mast bumping and the subsequent displacement of the transmission rearward and downward.

FINDINGS:

Cause Related:

1. While attempting to hold the helicopter stationary on a soft, muddy, uneven lakeshore while two passengers disembarked, the helicopter's forward cyclic control limit was inadvertently exceeded, resulting in severe mast bumping.

2. The main input drive shaft and coupling failed after striking the transmission isolation mount, when mast bumping caused the transmission to be displaced rearward and downward.

Other:

-Nil-

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OKANAGAN HELICOPTERS LTD.
BELL 206B C-FPON
NAHWITTI LAKE, BRITISH COLUMBIA 1 mi S
13 MAY 1987

REPORT NUMBER: 87-P70023 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1000 PDT
OPERATION: Specialty Aerial Construction
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	7,500	4,100
LAST 90 DAYS	134	134

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was slinging the outer shell of a radio repeater station to the top of a mountain near Nahwitti Lake. He had placed the building in position and lowered the collective to take the weight off the lanyard, when the helicopter suddenly dropped onto the building. The pilot reported that he pressed the cargo release button, at about the same time as the helicopter dropped. He applied up collective, and the helicopter climbed and then, with the external load still attached, the helicopter veered slowly to the right and began to descend. At about 10 feet above the trees, the pilot decided to put the helicopter down, and it came to rest on its right side, on sloping terrain, with the main rotor mast sheared; the pilot sustained minor facial injuries.

The pilot was licensed and qualified for the flight. He was not wearing a safety helmet at the time of the accident. The helicopter was not equipped with a shoulder harness for the pilot.

The helicopter was airworthy, and its weight and balance were within the prescribed limits. The type of cargo hook installed (Eastern Rotorcraft 2A15E) has a solenoid release mechanism which is activated by pressing the release button on the cyclic control. The cargo hook, however, does not open unless a force of approximately three pounds is acting on its load beam. The moment the button is released, the solenoid becomes deactivated, and, if the hook is not open at that time, it will become secured in the closed position. The cargo hook and the release mechanism functioned as designed when tested after the accident.

The site for the radio repeater station was at the top of a 2,413-foot mountain, which was steeply sloping and tree covered on all sides. The wind was from the southeast gusting at 10 to 15 knots, creating updrafts and downdrafts, and a light rain was falling.

The sling load was a building-like structure with three antenna attachment conduits protruding about two feet from the top. It was secured to the helicopter by two attachment points with a bridle and lanyard, the length of which provided an adequate clearance of 10 feet between the top of the conduits and the underside of the helicopter. When the accident happened, all three conduits penetrated the underside of the helicopter, at an angle indicating that the helicopter was in a nose-up attitude when it dropped onto the structure. One conduit entered the helicopter's cabin; another punctured the fuel tank, causing fuel to escape; and the third penetrated the cockpit floor under the pilot's seat, limiting the travel of the cyclic control until the helicopter was lifted off the building.

Gusty wind conditions with updrafts and downdrafts resulted in a momentary reduction in lift, causing the helicopter to drop at the same time that the pilot lowered the collective to take the weight off the lanyard. When the helicopter contacted the building, the pilot believed that the external load was no longer attached to the helicopter, and he raised the collective and made no further attempts to release the load. The pilot reported that, in his effort to lift off, he may have overpitched the main rotor blades, but there were no cockpit warnings; the helicopter then veered slowly to the right and began to descend.

It is probable that the hook did not open when the pilot pressed the release button because there was less than the required three-pound load on the hook at the time.

FINDINGS:

Cause Related:

1. A sudden downdraft caused the helicopter to settle onto the sling load.

2. As there was no tension on the sling line, the load did not release.

Other:

1. The helicopter was not equipped with a shoulder harness, nor was the pilot wearing a safety helmet.

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RIVERSIDE HELICOPTERS
BELL 206B (Helicopter) C-GYTA
GABRIOLA ISLAND, BRITISH COLUMBIA
15 MAY 1987

REPORT NUMBER: 87-P70025 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1420 PDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,500	4,000
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was slinging a 950-pound load of salmon fry from Duncan, British Columbia to a fish farm on Nelson Island. While en route, at about 500 feet above a treed area of Gabriola Island, the helicopter's engine (Allison 250 C20) lost power. The pilot attempted to release the external load, and he entered an autorotation. When the pilot arrested his descent at the top of the trees, the helicopter pitched forward and fell nose first to the ground. The helicopter was substantially damaged, and the pilot suffered serious injuries.

The pilot was qualified, and the weather was suitable for the flight. The helicopter had no known deficiencies before the flight, and it was being operated within its load and centre of gravity limits.

The engine was removed for examination, and teardown of the accessory drive gearbox revealed that a gear in the drive to the engine driven fuel pump had been incorrectly installed and had disengaged. As a result, the fuel supply to the engine was interrupted, and the engine flamed out. The engine accessory drive gearbox (part number 689171) was overhauled in 1983 and had been in service 1,352 hours since that time.

The helicopter had recently been acquired by the pilot's company. The external load jettison switch in the helicopter is the second switch from the bottom of the cyclic control grip . It is normally operated by the ring finger of the pilot's right hand. In other helicopters that the accident pilot had flown, the switch is located at the bottom of the grip and is operated by the little finger. There were no problems with the release system before the accident, and it operated normally when tested after the accident.

When the pilot attempted to release the external load, he may have pressed the bottom switch on the cyclic control grip. This was the wrong switch, and the load did not release. As the helicopter entered the tree-tops, the pendulum effect on the helicopter as the external load snagged the trees forced the helicopter to nose down.

The pilot normally wore a helmet while flying; however, on this occasion, it was being used by another pilot. The full force of the crash was taken by the cockpit area and aggravated the extent of the pilot's injuries. Had the pilot been wearing a helmet, some of the injuries to his head may have been prevented. The helicopter's emergency locator transmitter (ELT) was not switched on and therefore was not available to direct rescuers.

FINDINGS:

Cause Related:
1. The engine driven fuel pump ceased to operate because components of the engine accessory drive gearbox were incorrectly assembled during overhaul.

2. The helicopter's engine lost power because of fuel starvation.

3. The pilot may have pressed the wrong button, and the external load did not jettison.

4. The load snagged trees during the autorotation causing loss of control of the helicopter.

5. The pilot was not wearing his flying helmet.

Other:
1. The ELT did not operate because it had been turned off.

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TORONTO HELICOPTERS LTD.
BELL 206L-1 (Helicopter) C-GDJA
MANITOUWADGE LAKE, ONTARIO
23 MAY 1987

REPORT NUMBER: 87-O/70038 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0845 EDT
OPERATION: Contract
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	14,000	33
LAST 90 DAYS	33	33

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

After de-icing the helicopter and preparing it for a flight from Manitouwadge to Thunder Bay, the pilot did a 10-minute engine warm-up run; he then took off and began the climb-out on a westerly heading over Manitouwadge Lake. The helicopter was at an altitude of about 150 feet above ground level (agl) and at an airspeed of about 40 mph when the engine (Allison 250-C28B) lost power. The pilot reported that there was no excessive yaw as he began an autorotation and turned the helicopter left toward the shoreline. The helicopter ditched in the lake about 100 yards from shore. The pilot was able to escape without difficulty because one of the main rotor blades had cut off the nose section of the helicopter. During the landing, the helicopter sank in five feet of water.

PERTINENT INFORMATION:

The helicopter had been refuelled to capacity the day before the flight; there were no anti-ice additives in the fuel.

Witnesses on the shore watching the helicopter depart reported seeing something fly off the right side of the helicopter as it climbed out over Manitouwadge Lake; at the same time, there was a muffled bang, and smoke came from the engine as it began to decelerate.

The pilot tried to stretch the glide during the autorotation to land the helicopter on the lakeshore, and this resulted in a loss of main rotor rpm and a hard landing.

When the helicopter was recovered, all the damage found was attributed to the hard impact on landing. There was no external damage to the engine, transmission, or the cowlings. The engine was dismantled, and all internal damage was attributed to either the impact or to water immersion. The fuel control system was determined to have been serviceable at the time of impact.

The day before the accident, 1.1 inches of snow and freezing rain fell, and the temperature hit a low of minus four degrees Celsius. At 0800 eastern daylight time (EDT) on the morning of the accident, the temperature was zero degrees Celsius, with a dew point of 0.2 degrees Celsius and a trace of precipitation; the wind was from 040 degrees at 8 miles per hour.

The pilot reported that both the particle separator and the engine anti-ice systems were on for the take-off; however, the anti-ice was found switched to the OFF position when the helicopter was recovered; the switch is a positive lock switch which has to be pulled out to change from the ON to the OFF position.

Although the pilot had only 33 hours experience on the Bell 206L-1, he had over 2,500 hours in the Bell 206B; he was also an aircraft maintenance engineer (AME), endorsed on Bell 206 series helicopters. He reported that the helicopter had been operating normally up to the time of the accident. This type of helicopter is not equipped with an auto re-light system.

ANALYSIS:

The pilot did not report any excessive yaw at the time of the occurrence, indicating that the engine power loss could have been an engine deceleration rather than an engine failure or flame-out. An engine deceleration is usually a fuel governing malfunction. The Pc air lines, fuel governor, fuel pump, and fuel control unit were all checked and determined to be serviceable; therefore, the power loss was caused by either an intermittent malfunction or a fuel supply problem. An auto re-light capability may have prevented the accident if the cause of the power loss was due to an intermittent malfunction.

Impact damage made it impossible to determine the pre-impact serviceability of the complete fuel system. However, the fuel filter and all downstream fuel lines were serviceable and contained fuel. It was not possible to determine if the fuel in the helicopter was contaminated with water or ice; however, the supply from which the helicopter had been refuelled was examined and found to be uncontaminated.

The nature of the object seen flying off the helicopter was not determined; it was not from the engine area as this was the only intact and undamaged part of the helicopter. The muffled bang may have been from a compressor stall which would mean there was an air flow problem in the engine. The temperature and dew point spread at the time was such that ice formation in the compressor inlet was a possibility, restricting air flow into the engine and causing compressor stall. The smoke observed may have been unburned fuel produced by a reduction in the air flow through the engine or vaporized fuel or water coming out of a hot engine after a flame-out.

At the time of the engine problem, the helicopter had neither the altitude nor the airspeed to make a successful autorotation. This, combined with the fact that the pilot tried to stretch the glide during the autorotation, led to the hard impact.

FINDINGS:

Cause Related:
1. The engine lost power for undetermined reasons, and, as a result, the pilot was forced to ditch the helicopter.

Other:
1. There is no auto re-light system installed in Bell 206L-1 helicopters.

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ZIMMER AIR SERVICES INC.
SIKORSKY S-55B (Helicopter) C-GGRK
GARTER LAKE, ONTARIO
05 JUNE 1987

REPORT NUMBER: 87-O70043 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0907 EDT
OPERATION: Specialty Aerial Application and Distribution
DAMAGE: Destroyed
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,006	162
LAST 90 DAYS	26	26

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The helicopter was employed on the Ontario gypsy moth spray program; 10 minutes after take-off, for the third spray swath, when the helicopter was in level flight at 40 feet above the tree-tops, the engine (Curtiss Wright R1300-3D) suddenly lost power. The pilot attempted an autorotation into a swamp and settled into the trees. The right side of the helicopter, just in front of the right main landing gear, struck a large maple tree, knocking it down, and the helicopter then descended on top of the tree. The pilot was seriously injured but was able to escape from the wreckage; a post-crash fire subsequently broke out, destroying the helicopter.

PERTINENT INFORMATION:

On the morning of the accident, the helicopter had been operating on spray flights, accumulating a total of three hours flying time without incident. Immediately prior to the accident flight, the pilot had returned to the mobile tanker from a 25-minute flight. He loaded the helicopter spray tank with 605 litres of chemical spray, while the helicopter engine was running, and departed on the next spray run. The fuel on board at this time, according to the fuel sight gauge, was 30 Imperial gallons.

At 0830 eastern daylight time (EDT), the weather conditions as reported by the Ontario Ministry of Natural Resources at Westport, 14 miles northeast of the accident site, were clear sky, temperature 12 degrees Celsius, humidity 64 per cent, and wind 15 to 18 knots from the northeast.

The pilot was experienced and current, having flown 26 hours on this helicopter in the previous month and three hours immediately prior to the accident.

One week before the accident, the pilot had carried out a safe emergency landing after the failure of a hydraulic line to the lateral servo unit. The ruptured hydraulic line was replaced. There were no other reported problems with the helicopter before the accident.

The post-crash fire destroyed the helicopter; all magnesium components, including part of the engine case, transmission case, and fuselage, were completely burned away. The majority of engine components were unidentifiable because of the severe fire damage. The air intake and air filter were identified and determined to have been serviceable prior to the accident. The magnetos were identified, but it was not possible to determine their serviceability. The engine-driven fuel pump was not identified.

The Canadian Aviation Safety Board could not determine if there had been a failure of the internal cam drive gear which drives the valves, or a fuel line failure. Either of these would have caused a sudden loss of engine power.

ANALYSIS:

An engine which has been running smoothly and then suddenly stops without warning has suffered a failure of either the air, fuel, ignition, or mechanical systems. As far as could be determined, there was no failure of the air intake system. It was, however, not possible to determine if the cam drive gear was serviceable at the time of the engine failure. The ignition system is a dual system for redundancy, and it is unlikely that the pilot would have removed his hands from the controls at 40 feet above the trees to turn the magneto switches off. The carburettor, fuel pump, and all the fuel lines were destroyed by the fire, but it was determined that the mixture control was in the operating position.

The sudden engine failure was probably caused by either an interruption in the fuel supply, that is, a ruptured fuel line or fuel pump failure, or by a failure of the cam drive gear.

FINDINGS:

Cause Related:
1. The engine failed for undetermined reasons.

2. The pilot attempted an autorotation, but the helicopter struck the trees and was destroyed by an intense post-crash fire.

Other:
-Nil-

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LIFTAIR INTERNATIONAL 1985 LTD.
BELL 206B (Helicopter) C-GBHF
PRINCE ALBERT, SASKATCHEWAN 35 mi E
09 JUNE 1987

REPORT NUMBER: 87-C70031 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1430 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,311	1,050
LAST 90 DAYS	121	116

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The helicopter had been chartered to perform fire-control duties to the east of Prince Albert, Saskatchewan, where a number of fires were burning. On arrival in the area, the pilot landed, contacted the fire chief, and was assigned the job of bucketing water to one of the fires. The pilot departed to the only water source in the area, a small beaver pond. After arriving at the pond, the pilot lowered the bucket, which was attached to a 15-foot lanyard, but the water was too shallow for the bucket to sink. The pilot manoeuvred the helicopter to an area where the water appeared to be deeper and again lowered the bucket. The bucket sank, and, as the pilot applied collective to raise the load and commence forward flight, he noticed a sudden rise in turbine outlet temperature (TOT). While checking the mirror to ensure that the cable had not snagged over the skid, the pilot felt a "jerk", and the helicopter rolled right and struck the water. The pilot, who had been wearing a protective helmet and shoulder harness, was able to extricate himself and swim to shore; he was rescued about four hours later.

PERTINENT INFORMATION:

The weather was suitable for this type of operation, and the weight and centre of gravity were within the prescribed limits. The aircraft was operating satisfactorily prior to the accident. The TOT rise observed by the pilot was the normal increase in temperature which occurs when the collective is pulled, but it occurred faster than usual – the temperature needle always stayed below the red line.

The pilot was flying his first water-bucket operation of the season. When he moved the bucket to deeper water, he moved away from his reference point which made it more difficult to maintain position. A beaver house, close to the deepest part of the pond, was not used for reference as this would have resulted in a downwind component. The area selected to fill the bucket was saturated just below the surface with thick weeds that were not visible from the helicopter.

There was no radio communication between the fire chief and the pilot after the helicopter departed. Following the crash, the pilot swam to shore; he then returned to the aircraft and retrieved the emergency locator transmitter (ELT) along with other survival equipment. The ELT was turned on but did not function. Tests subsequently revealed that the battery output was low. The pilot was rescued about four hours later by another helicopter flying in the area.

ANALYSIS:

After the bucket was filled, the pilot applied power, and, at that time, he noticed the rise in TOT. Following this, he checked the mirror to determine the position of the cable. While his attention was diverted, the aircraft was allowed to move to the right. The full bucket was unable to move as rapidly because of the dense weeds, and, as a result, the cable tightened and pulled the aircraft over.

The pilot's use of a protective helmet and shoulder harness probably prevented serious injuries.

There were no procedures in place to ensure that a listening watch or periodic communication check was carried out between the helicopter and the fire chief. This resulted in a lengthy time until rescue. The ELT did not function because of low battery output.

CONCLUSIONS:

Findings:

1. While filling the bucket, the pilot's attention was momentarily diverted, and the aircraft moved to the right. The bucket could not move in concert because of dense weeds, and the cable pulled the aircraft over.

2. The pilot was wearing a protective helmet and shoulder harness which probably prevented serious injuries.

3. There was no procedure in place to ensure that radio communication between the helicopter and the fire-control centre was maintained; as a result, rescue was delayed.

4. The ELT did not function because of low battery output.

Causes:

When the aircraft moved to the right, the water-filled bucket could not move as quickly because of dense weeds, and the cable tightened and pulled the aircraft over.

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CAN-ARC HELICOPTERS LTD.
SIKORSKY S-58BT C-GUSD
BRABANT LAKE, SASKATCHEWAN 10 mi SE
17 JUNE 1987

REPORT NUMBER: 87-C70042
DAMAGE: Substantial

	Pilot-in-Command
Pilot Licence	Commercial Rotorcraft
Total Flying Time	6,500 hr
Total on Type	700 hr
Total Last 90 Days	60 hr

Injuries:	Crew	Passengers	Others	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	1	-	-	1
Total	1	-	-	1

HISTORY OF THE FLIGHT:

The twin-engined helicopter was dispatched to pick up a forest fire protection crew which was threatened by an approaching fire. The crew was located on a rock outcropping approximately 15 feet above the surface of a small lake. On arrival at the site, the pilot balanced the helicopter with one wheel on the rock outcropping and the other over the lake surface, and the fire protection crew began to board. The helicopter crewman, who occupied the left seat in the cockpit, left his position and entered the passenger cabin to assist in the loading. Shortly thereafter, the number two engine lost power, and the pilot directed the personnel on board to exit the aircraft. Following the evacuation, the aircraft began to slowly descend and drift sideways over the lake. The pilot was unable to arrest the descent, and the aircraft settled into the lake. The uninjured pilot exited the helicopter and was rescued immediately by another helicopter and crew.

The accident occurred at lat 56°06'N, long 103°44'W at 2215 central standard time (CST), during the hours of daylight. The accident site is approximately 1,250 feet above sea level (asl).

PERTINENT INFORMATION

The flight crew compartment is located in front of and above the passenger cabin. Flight crews enter the cockpit through a side window and have access to the passenger cabin through two small hatches in the aft cockpit bulkhead. The hatches are four feet above the passenger cabin floor and are inboard and behind each cockpit seat. In order to move through the hatchway, one must stand up, avoiding the cyclic control, remove the seat cushion, and fold the seat out of the way. Then, holding the seat away from the hatch, step feet first through the hatch and drop to the passenger cabin floor. The area is very confined and care must be taken not to interfere with the operation of the aircraft.

Between the hatches, there is a horizontal switch panel running from the aft bulkhead forward to the instrument panel. The fuel shut-off switches are located at the midway point of the panel, on the side nearest the left seat. The fuel shut-off switches are two-position toggle switches, guarded to the open position by a latching mechanism at the base of the lever arm. Aft movement of the lever arm selects the closed position.

The manufacturer's flight manual contains a chart for "limiting heights and corresponding speeds for a safe landing following a partial power failure." At conditions of maximum weight, operations at heights above 10 feet are not approved at forward speeds below 25 knots.

ANALYSIS:

The investigation determined that all engine and fuel systems were in functional working order. However, when the aircraft was recovered from the lake, the number two fuel shut-off switch was found in the closed position. An examination of the fuel shut-off solenoid valves revealed that the number two valve was also in the closed position. It was evident that the shut-off switch had been inadvertently moved to the closed position.

The number two engine lost power shortly after the crewman vacated the left cockpit seat and descended into the passenger cabin. The only plausible reason for the loss of engine power is that the crewman inadvertently knocked the externally unguarded number two fuel shut-off switch to the closed position while moving in the confined cockpit area to enter the cabin. This caused the fuel shut-off solenoid valve to close, and the engine stopped because of fuel starvation.

As the number two engine was winding down, the pilot directed the passengers to leave the aircraft, then applied full power on the remaining engine. The power output was insufficient to arrest the rate of descent, and the aircraft settled into the water.

The fire protection crew had not constructed a landing pad, and, following a single attempt to contact them by radio, the pilot decided to board the crew and their equipment while balancing the aircraft with one wheel on a rock outcropping. Had a suitable landing pad been constructed, the accident could have been avoided.

CONCLUSIONS:

Findings:

1. The crewman inadvertently moved the number two fuel shut-off switch to the closed position when he exited the flight crew compartment.

2. The number two engine stopped because of fuel starvation when the number two fuel shut-off solenoid valve closed.

3. The helicopter was unable to maintain flight on the remaining engine.

4. A suitable landing area was not used to board the passengers and equipment.

5. The fuel shut-off switches were not externally guarded.

6. The pilot was certified and qualified for the flight in accordance with existing regulations.

7. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

8. There was no evidence found of any airframe failure or system malfunction prior to or during the flight.

9. The weight and centre of gravity were within the prescribed limits.

Causes:
The number two fuel shut-off switch was inadvertently moved to the closed position.

SAFETY ACTION:

Action taken:
Following this occurrence, the Canadian Aviation Safety Board forwarded an Aviation Safety Advisory to Transport Canada suggesting that owners of S58T helicopters be encouraged to incorporate a 'guard' on the fuel shut-off switch to protect against inadvertent OFF selections.

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EVERGREEN HELICOPTERS
BELL 205A (Helicopter) N8138J
GREEN LAKE, SASKATCHEWAN
21 JUNE 1987

BRIEF NUMBER: 87-C70902 (Accident)
LOCAL TIME: 1940 CST
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial (U.S.A.)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	3,500	N/A
LAST 90 DAYS	200	200

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was landing, and, after releasing the water bucket, he was manoeuvring rearward so that the helicopter would be clear of the bucket before touchdown. The helicopter drifted to the right, and the tail rotor struck a storage shed. The pilot landed the aircraft without further damage.

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NIPISSING HELICOPTERS (1984) INC.
BELL 206L-1 (Helicopter) C-GAHZ
GOGAMA, ONTARIO 50 mi SW
22 JUNE 1987

REPORT NUMBER: 87-O70049
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1622 EDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Helicopter

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,975	412
LAST 90 DAYS	8	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot of the helicopter had just deplaned six passengers from a bush camp and was in the process of lifting off the landing pad to pick up another crew. After lift-off, the helicopter swung about 45 degrees to the right, then abruptly ascended. This was followed by a rapid descent, and the tail rotor guard struck the pad. The helicopter bounced back into the air, turned right through 180 degrees, and struck the ground. The main rotor blades separated as they dug into the ground, and the helicopter came to rest on its right side about 19 feet from the pad.

PERTINENT INFORMATION:

The landing pad was a 20-foot square unobstructed, wooden platform standing three feet above the ground, approximately 1,400 feet above sea level. The temperature was about 27 degrees Celsius.

The helicopter lifted off on a 210-degree heading, with a 45-degree left cross-wind at less than five knots. The helicopter was serviceable prior to the flight, and the centre of gravity and weight were within limits.

The pilot had not flown for five years and had just recently joined the company; a pilot proficiency check on type was required and completed after three and one-half hours dual flight, three days before the flight.

During lift-off, the helicopter's cyclic stick was in a neutral position as the left skid came off the ground first, which the pilot felt was normal. With the right skid low, the pilot felt the helicopter swinging right. He reacted by abruptly pulling the collective up, and the helicopter sprung rapidly into the air, accelerating the swing to the right. At about 10 feet above the ground, the pilot noticed on the engine gauges that 110 per cent torque had been applied and that the turbine outlet temperature (TOT) had reached 850 degrees Celsius. The recommended engine limits for take-off maximum continuous in the manufacturer's type specifications are 100 per cent torque and a TOT of 791 degrees Celsius. Aware that the normal take-off limits had been exceeded, the pilot abruptly lowered the collective. Altitude was lost quickly, and, in anticipation that the helicopter was about to hit the platform, the collective was jerked up again to arrest the descent. The pilot heard a thump from the rear after this movement, and the helicopter proceeded to rotate further right, drifting to the north of the pad about 15 feet. Prior to crashing, the pilot lowered the collective and closed the throttle. The pilot believed he overreacted with the collective and underreacted with the cyclic control during lift-off.

On single-rotor helicopters with anti-clockwise rotating blades, the right swing on lift-off is controlled by application of left pedal. There was nothing on the platform to indicate the right skid was snagged during lift-off.

ANALYSIS:

When the pilot felt the helicopter swing to the right on lift-off, he should have applied left pedal to counteract the right swing tendency. The coarse application of collective at this stage caused the helicopter to lift off rapidly and aggravated the right yaw. Lowering the collective abruptly by a large amount then caused the helicopter to descend quickly and hit the platform; as a result, the rotor blades flexed downward, struck the tail boom, and severed the drive shaft.

FINDINGS:

Cause Related:

1. The pilot was unable to establish the helicopter in a controlled hover after lift-off because he did not apply the correct flight control inputs.

2. The rate of descent was not checked, and the helicopter landed heavily while in an uncontrolled swing to the right; as a result, the main rotor blades flexed downward and struck the tail boom.

Other:
-Nil-

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NIPISSING HELICOPTERS (1984) LTD.
BELL 47 (Helicopter) C-FQJY
LAC ELMER, QUÉBEC
25 JUNE 1987

BRIEF NUMBER: 87-Q70023 (Accident)
LOCAL TIME: 1530 EDT
OPERATION: Contract
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,872	248
LAST 90 DAYS	258	248

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	-
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot of the helicopter was picking up a full fuel drum to transport it to a nearby campsite. During the hover to lift the drum, the pilot noticed that more power than normal was required to hover, and he immediately released the load. The engine rpm then started to decay very rapidly; the helicopter lost altitude, struck the ground, and rolled over. The pilot released his seat-belt and climbed out, uninjured. The helicopter was substantially damaged. The power loss was caused by a malfunction of the density controller.

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ALC AIRLIFT CORPORATION
HUGHES 369D C-GIPX
MOUNT HENRY CLAY, BRITISH COLUMBIA
27 JUNE 1987

REPORT NUMBER: 87-P70042 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1800 PST
OPERATION: Contract
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	6,950	18
LAST 90 DAYS	150	18

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	2	1	-

HISTORY OF THE FLIGHT:

The pilot and three passengers departed in the helicopter from the Freeport/Stryker base camp at 1534 Pacific daylight time (PDT) for a flight to several radio repeater sites in the area.

Two passengers were deplaned at one site, and the helicopter continued to the Repeater Pass site on Mount Henry Clay where a third passenger was left. The pilot then returned to the base camp and took two additional passengers to Repeater Pass. The passengers were to clear snow from the site and to install an antenna.

The pass was blanketed with fog earlier in the day so the operation had been delayed. Later, some fog was still present, but the helicopter was able to land.

The helicopter did not return to base at the end of the day, and a search located the helicopter where it had crashed, a short distance from the Repeater Pass on a snow-covered slope. The pilot and front-seat passenger did not survive the crash; both rear-seat passengers survived, but one later died as a result of his injuries.

PERTINENT INFORMATION:

The pilot was properly licensed and qualified to undertake the flight. He had been checked out on the Hughes 369D helicopter several weeks earlier, and his experience on type was limited. However, he had over 6,800 hours of flying time on other helicopter types and had flown a Bell 206 in the same general area several seasons earlier.

The weather in the general area at the time of the accident was clear with unlimited visibility; however, in the area of the accident site, dense fog was generated by a light breeze lifting moist air over the mountain pass; this moisture was produced by the sun melting the glacial snow. Since the wind was light and variable, fog would have been produced near the top of the pass and then have dissipated as the air subsided on the far side. The fog was limited to several hundred feet in extent and would have tended to dissipate when the wind died down. The fog was intermittent, but visibility was probably severely restricted for variable and unpredictable periods of time.

The helicopter was examined after the accident, and no evidence of failure or malfunction of the engine, airframe, or controls was found. The main rotor blades showed severe bending and twisting which is consistent with substantial power being developed at impact. The evidence at the scene of the accident indicated that the left skid made contact with the snow first, and the helicopter then somersaulted and came to rest facing about 180 degrees to the direction of flight. One blade from the main rotor struck a tail-rotor blade during the rollover and tore a portion of the blade away from the hub. This portion of the tail-rotor blade was found about 200 yards back along the flight path. The driveshaft between the engine and transmission couplings was found to have failed under a shearing load.

The emergency locator transmitter (ELT) was found to be serviceable, with the switch in the ARMED position, but the antenna was broken off, and no signal was transmitted.

ANALYSIS:

Because there were no witnesses and the survivor did not remember any details of the accident, the investigation concentrated on the weather conditions and the position of the wreckage. A dense localized fog had been forming intermittently at Repeater Pass during the morning on the day of the accident, and attempts to reach the area were unsuccessful. The fog gradually decreased during the morning, and the pilot was able to transport the crews to the repeater sites in the early afternoon. The helicopter remained at the Repeater Pass site while the crew worked, and, at 1730, the pilot radioed the other repeater site work crew on a nearby mountain, and he was advised that they had not completed their task and that they would call him when they were ready to be flown back to base camp. Their later attempts to contact the helicopter between 1800 and 1830 PDT were not successful. On the basis of this information, the time of the accident was estimated as being between 1730 and 1800 PDT.

The work crew from the other repeater site could see the general area of Repeater Pass and reported that billowing fog was visible at about the time of the accident. The investigators were not able to land at the scene of the accident because of the danger of avalanche, but the site was examined from the air and described by the mountaineers who had made the rescue. The evidence indicated that the helicopter was climbing in forward flight when it flew into the snow-covered mountainside. The direction of flight was toward the peak of Mount Henry Clay rather than the direction of the base camp, which was about 90 degrees to the right. The point of impact was about 200 feet higher than the repeater site from which the helicopter had departed. It is probable that the pilot took off in reduced visibility and was climbing toward the peak of Mount Henry Clay where bare rocks provided some visual reference as he attempted to climb above the fog layer in an otherwise totally white environment; it was during this phase of flight that the helicopter struck the snow-covered mountainside. It could not be determined why the pilot chose to depart at that particular time; the antenna had not been installed, so it is probable that the pilot was concerned with being trapped on the mountain by the fog and decided to leave before completing the work, when the fog condition appeared to improve. The fact that shovels were left at the repeater site supports the assumption that the decision to depart was made quickly. Since the density of the fog could change from minute to minute, it could have cleared and then become thicker while the helicopter was being boarded and started. The fog conditions and snow-covered mountain could have easily combined to create whiteout conditions which may have obscured the pilot's visual reference points from view and caused him to become disoriented after take-off and to inadvertently fly into the mountainside.

CONCLUSIONS:

Findings:
1. Intermittent heavy fog was present in the accident area.

2. A combination of fog and snow-covered ground may have produced whiteout conditions in which visual reference was obscured.

Causes:
It is probable that the pilot lost visual reference while attempting flight in fog and whiteout conditions and inadvertently flew into the snow covered mountain.

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TOTEM AIR LTD.
BELL 206B (Helicopter) C-GXNM
HIGH PRAIRIE, ALBERTA 19 mi NE
02 JULY 1987

BRIEF NUMBER: 87-W70046 (Accident)
LOCAL TIME: 2140 MDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	937	662
LAST 90 DAYS	225	225

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

While the pilot was landing the helicopter in a narrow seismic cut line to pick up fire-fighters, the main rotor blades struck a tree. The pilot completed the landing without further incident. The main rotor blades sustained damage during the tree contact.

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AERIAL RECON SURVEYS
ROBINSON R22 BETA (Helicopter) C-GJEW
FORT ST. JOHN, BRITISH COLUMBIA 90 nm NW
04 JULY 1987

REPORT NUMBER: 87-W70047 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1110 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,000	681
LAST 90 DAYS	280	280

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot had flown from Fort St. John, British Columbia on a one and one-half hour flight to an oil well site located 90 nautical miles to the northwest. After completing a half hour's ground work, the pilot prepared for a flight to another well site two miles to the north. Approximately six minutes after starting the engine and while climbing out of the oil well site clearing, the pilot heard the main rotor low rpm warning horn. The pilot attempted to regain the rotor rpm by lowering the collective lever and opening the throttle but was unsuccessful, and a power-off landing in the trees was made. A last minute flare placed the helicopter into the trees in a nose-high attitude.

The accident site was mid-way between Fort St. John and Fort Nelson, British Columbia. The temperatures and dew points for these locations were 16 degrees/ 7 degrees Celsius and 17 degrees/10 degrees Celsius respectively. The pilot reported that carburettor heat was required on the previous flight, but it was not used before or during the take-off just prior to the accident. A 50-hour inspection had been completed the previous day. A post-crash inspection was carried out on the helicopter; no faults were found that could have contributed to the accident.

The engine was run several times in the airframe and then run several times in a test cell; it ran normally and produced full power.

A review of the Carburettor Icing Chart in the Aeronautical Information Publication (AIP) Canada showed that at the respective temperatures and dew points, there would probably have been carburettor icing during cruise or climb; the pilot stated that he did not use carburettor heat before or during the take-off. Approximately six minutes had passed from the time that the engine had been started to the time of the accident; this was sufficient time for carburettor ice to form under the existing atmospheric conditions.

FINDINGS:

Cause Related:

1. The atmospheric conditions were conducive to carburettor icing during the take-off.

2. The pilot did not ensure that there was no carburettor icing present prior to take-off.

Other:

-Nil-

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VERSATILE AIR SERVICES LTD.
BELL 206B C-GLQB
HALIFAX INTERNATIONAL AIRPORT, NOVA SCOTIA
17 JULY 1987

REPORT NUMBER: 87-A70021 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1625 ADT
OPERATION: Commercial Non-Revenue
DAMAGE: Destroyed
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:

	PILOT-IN-COMMAND		CO-PILOT	
	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	5,200	3,400	1,500	150
LAST 90 DAYS	80	68	70	70

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	2	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The float-equipped helicopter departed Halifax International Airport on a local training flight. The company chief pilot occupied the left seat, and a new company pilot, who was under going a check-ride, occupied the right seat and was at the controls. The crew had completed about one hour of training, the last 15 minutes of which was autorotation training. The helicopter was climbing out from a power recovery autorotation and was at an altitude of about 300 feet above ground level (agl), when the engine (Detroit Diesel Allison 250-C20B) suddenly flamed out, and the helicopter pitched nose-down and rolled hard to the right. The trainee pilot lowered the collective and applied right pedal, to enter an autorotation, and left cyclic, in an attempt to level the helicopter. The chief pilot took control and established the helicopter in a level autorotation between 75 to 150 feet agl. He raised the collective in order to clear power lines on the flight path to the selected landing area beside a highway. After clearing the power lines, the helicopter dropped almost vertically and crashed beside the highway. The aft crosstube was driven up through the fuselage to the top of the fuel cell, and the helicopter nosed over.

PERTINENT INFORMATION:

There was no evidence of any pre-impact failure of the helicopter control system that would have contributed to the cause of the accident.

The airport weather office did not record any unusual weather conditions during this period, and weather is not considered a factor in this occurrence.

An examination of the engine and bench testing of the engine components did not reveal any discrepancies that would have caused the engine to flame out.

The operation of the engine auto re-ignition was reported to have been intermittent during ground tests and was not armed during the flight. The auto re-ignition control was installed and tested on another helicopter and was found serviceable.

Laboratory analysis of a fuel sample taken from helicopter showed that the fuel was of the proper type and that it was free of contaminates.

After an engine failure in this type of helicopter, if pedal correction is not taken immediately, the helicopter tends to yaw left and tuck under, causing a roll to the right. The roll opposite the yaw is more likely on a helicopter equipped with floats and could be severe if the helicopter was in a climbing right turn. The practice autorotations were being carried out from right-hand circuits, but the helicopter's position in the circuit when the engine flamed out was not established.

The trainee pilot had spent the previous few days driving from Alberta and had arrived in Halifax late the night before the accident. It could not be determined if fatigue was a factor in his response to the engine flame-out.

The chief pilot reported that when he took control, the rotor rpm was down to about 85 per cent. He had to use significant right pedal, and he said the cyclic felt mushy. After a level attitude was established, he elected to stretch the glide in an attempt to land beside the highway rather than autorotate into the trees. When he raised the collective to clear the power lines, the rotor rpm decreased to the point where the rotor blades could not produce enough lift to prevent the helicopter from descending rapidly and landing hard.

ANALYSIS:

The helicopter was probably in a climbing right turn when the engine failed. Before the trainee pilot reacted, the helicopter had tucked under and rolled to the right. The cyclic felt mushy when the chief pilot took control because the rotor rpm had decreased. The engine and its components checked out to be serviceable, and the cause of the flame-out could not be determined. If the auto re-ignition system had been armed, it is possible that the engine would have re-lit. Because the chief pilot attempted to stretch the glide beyond the gliding capability of the aircraft, the rotor rpm was lost, and the aircraft settled down at a high rate of descent.

CONCLUSIONS:

Findings:

1. The engine flamed out for undetermined reasons.

2. The engine auto re-ignition system was not armed.

3. The trainee pilot did not react in time to prevent the helicopter from tucking under and rolling to the right.

4. The chief pilot took control and attempted to autorotate to an area beyond the glide capability of the helicopter.

Causes:

The engine flamed out for undetermined reasons. The trainee pilot did not react quickly enough to control the helicopter, and, when the chief pilot took control, he attempted to autorotate to an area beyond the gliding range of the helicopter.

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CANWEST AVIATION (1984) LTD.
HUGHES 269C C-GJEF
OKOTOKS AIRPARK, ALBERTA
23 FEBRUARY 1987

REPORT NUMBER: 87-W70014 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0900 MST
OPERATION: Commercial Non-Revenue
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	656	386
LAST 90 DAYS	21	21

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot departed Okotoks Airpark on a local circuit. While the helicopter was turning downwind at about 400 feet above ground level (agl), the engine (Lycoming H10-360-D1A) started to overspeed. When the engine and main rotor rpm indicator needles split, the pilot lowered the collective and attempted to turn into wind for an autorotational landing. The helicopter struck the ground heavily and was substantially damaged. The pilot was wearing a shoulder harness and escaped with minor injuries.

PERTINENT INFORMATION:

On 12 January 1987, a replacement engine of the same type and model as the original one was installed in this helicopter; since that installation, the helicopter had flown 141.1 hours. Examination of the lower drive coupling revealed that it had been properly greased, but the lower drive coupling bumper plug had not been installed. On subsequent removals and installations of the lower drive coupling, the missing plug was not detected. The hole for the bumper plug was found to be full of grease.

Section 3:14 of the 269 Series *Helicopter Maintenance Instructions Manual, Engine Installation*, cautions the reader to determine that the lower coupling driveshaft forward bumper plug is in place before installing the coupling adapter.

ANALYSIS:

When the replacement engine was installed, the absence of the bumper plug went unnoticed, but, as the cavity was full of grease, the drive coupling was prevented from moving forward. However, when some of the grease passed through the spherical splines, the drive coupling was able to move forward, and the engine then became decoupled from the transmission, which resulted in the engine overspeeding.

FINDINGS:

Cause Related:

1. The lower drive coupling forward bumper plug was not installed during the engine change.

2. The lower drive coupling moved forward, allowing the engine to decouple from the transmission and causing the engine to overspeed.

Other:

1. As the pilot was wearing a shoulder harness, he was not seriously injured.

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ANGSTROM CORPORATION F28-A (Helicopter)
C-GHKM
PALGRAVE, ONTARIO 2 mi W
04 JUNE 1987

REPORT NUMBER: 87-O/70042 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2040 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	650	2
LAST 90 DAYS	4	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The evening was calm and clear, so the pilot decided to do some hover checks and fly circuits in his helicopter. During his first climbing turn, at about 350 feet above ground level (agl), the engine rpm decreased from 3000 to 2750 rpm. The pilot, recognizing that he had overpitched the main rotor blades, pushed the nose down with the cyclic control, and slightly reduced the amount of collective input, in an attempt to regain lost engine rpm. As the helicopter was close to the trees, the pilot did not lower the collective control fully and was unable to regain sufficient engine and main rotor rpm. The helicopter continued to descend and was ditched in a pond where it rolled onto its right side. The pilot escaped without injuries.

The pilot had purchased the helicopter about two years before. He had intended to take the training required for a helicopter pilot's licence on his own helicopter; however, because of a series of circumstances, the pilot had not completed the helicopter training. Most of the training had been on Bell 47 helicopters, and the pilot had not been checked out to fly solo in the Engstrom.

This type of helicopter is subject to overpitching of the main rotor blades, which overloads the engine and causes a loss of main rotor and engine rpm. The rpm can only be regained if the load is removed from the engine; this is accomplished by lowering the collective control, which in turn flattens the pitch of the main rotor blades and reduces the amount of lift produced. In practice, this can only be done if there is sufficient altitude to descend and recover.

Had the pilot completed his check-out in the helicopter, he would have monitored the engine rpm more closely and been able to avoid overpitching the main rotors. The inexperienced pilot overpitched the helicopter's main rotor blades in the climb and was unable to regain normal engine and main rotor rpm, thus necessitating the forced landing.

FINDINGS:

Cause Related:
1. The pilot was not a licensed helicopter pilot, nor was he checked out to fly solo in the Engstrom.

2. The pilot overpitched the main rotor blades which caused the engine and main rotor rpm to decay.

3. The pilot was unable to bring the engine and main rotor rpm back up to normal, and the helicopter was ditched in a pond.

Other:
-Nil-

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RIVERSIDE HELICOPTERS LTD.
HUGHES 369D C-GTNR
BLISS LANDING, BRITISH COLUMBIA
20 JUNE 1987

REPORT NUMBER: 87-P70037 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1550 PDT
OPERATION: Charter
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	4,500	1,500
LAST 90 DAYS	240	240

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The helicopter had been chartered to sling three 500-pound fish nets from Powell River, British Columbia to a commercial fish farm at Kinghorn Island, British Columbia. Following two uneventful round trips, the helicopter departed Powell River at approximately 1535 Pacific daylight time (PDT) on the third trip. As the helicopter passed abeam Bliss Landing, the pilot felt the external load fall from the aircraft. As he slowed the helicopter, it began to vibrate; the helicopter then pitched up and rolled onto its right side. At this time, the passenger sitting in the right front seat looked down and saw the net and fiberglass tray fall into the water and also noted that the wooden pallet was near the helicopter but falling away. The pilot restored the helicopter to level flight but was unable to stop the right turn. Approximately 20 feet above the water, the pilot increased collective, and the helicopter gently entered the water, then rolled onto its right side and sank. Both the pilot and the passenger escaped from the helicopter uninjured and were rescued by a passing fishing boat.

The fish nets were painted with a copper solution, then each one was wrapped in plastic and placed in a fiberglass tray which was set on a wooden pallet. On the first two trips, the pilotused three-quarter-inch polypropolene rope wrapped around the pallet and net. On those flights, the pilot ensured that the rope was fed through an eye on the end of the rope, then attached to the helicopter sling hook. When the load was lifted, the rope slid through the eye on one end of the rope and choked the net and pallet tightly together. On the third trip, a shorter one-half-inch polypropolene rope with eyes installed at both ends was used. On this trip, the rope was wrapped around the pallet, and both rope eyes hooked onto the helicopter sling hook. The net was not secured to the pallet; thus, when the load was lifted, there was no choking action tightening the load onto the pallet. There are no airworthiness standards for helicopter sling gear.

During the flight, the net and tray, which were not secured to the pallet, slid off. The empty pallet was then blown up and rearward, and the tail rotor was torn off when it was hit by the line. The pilot was unable to get sufficient forward airspeed to control the right turn, and he ditched the helicopter.

FINDINGS:

Cause Related:
1. The sling load was not attached securely to the pallet, and the load slipped off the pallet.

2. The pallet and line were blown upward and rearward into the helicopter tail rotor.

Other:
1. There are no airworthiness standards for helicopter sling gear.

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BELL 206B JETRANGER (Helicopter) C-FQZB
GAMBIT LAKE, NORTHWEST TERRITORIES
10 mi S
12 JULY 1987

REPORT NUMBER: 87-W70049 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1430 MDT
OPERATION: Private Company Business
DAMAGE: Substantial
PILOT LICENCE: Commercial Rotorcraft

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,580	2,500
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The helicopter was moving a diamond drill rig to a new location approximately 100 feet away. Two loads had been moved to the new location, and a sling load of planks had just been lowered onto the drill platform. The pilot was picking up the load again to reposition it on the platform when he heard an unusual noise coming from behind him. He jettisoned the load, and the helicopter began to move backwards. The pilot applied full forward cyclic to stop this motion; however, the helicopter continued its rearward movement and contacted the ground tail first. The pilot rolled the aircraft to the right to avoid settling on two men on the platform. The aircraft struck the ground and came to rest on its right side.

An examination of the rotating components, the controls, and the engine did not reveal the reason for the unusual noise reported by the pilot. There was no indication that the sling cable had snagged a skid, which would have affected the centre of gravity of the helicopter. The pilot reported that all flight controls functioned normally and that there was no indication of an engine failure. The aircraft was within its maximum weight and centre of gravity limitations. The outside air temperature was 22 degrees Celsius and the wind was calm.

The cause of the accident could not be determined.

CONCLUSIONS:

Findings:
1. The pilot heard an unusual noise and jettisoned the load.
2. The helicopter moved rearward without control input by the pilot.
3. While moving rearward, the helicopter contacted the ground tail first and crashed.

Causes:
The helicopter crashed for undetermined reasons.

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DEPARTMENT OF TRANSPORT
BELL 212 (Helicopter) C-GCHT
WAWA AIRPORT, ONTARIO
22 JUNE 1987

BRIEF NUMBER: 87-O/74129 (Incident)
LOCAL TIME: 1130 EDT
OPERATION: State
DAMAGE: None
PILOT LICENCE: Airline Transport-Rotorcraft Endorsement

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	11,846	3,030
LAST 90 DAYS	137	100

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	4

REPORTED CIRCUMSTANCES:

The helicopter lifted off from the refuelling area adjacent to the north end of runway 03 and overflew part of the tarmac where several light aircraft were parked. Two of these aircraft suffered rotor wash damage to their control surfaces when the helicopter passed to their right in translation flight at about 25 knots.

The weather was ideal for visual flight. There were several aircraft in the area preparing to land on runway 03. Because of airport congestion and construction, the pilot departed southbound from his position after the first aircraft had landed with the intention of clearing the parked aircraft skirting the edges of the north runway. He broadcast his departure procedures on the UNICOM frequency, indicating that the helicopter would remain clear of all aircraft. The pilot continued on to his destination without any knowledge of the incident.

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BIRDMAN CHINOOK WT 2S (Ultralight) C-ISND
PRINCE ALBERT, SASKATCHEWAN 30 mi N
08 MARCH 1987

REPORT NUMBER: 87-C75001 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1400 CST
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Ultralight Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	300	3
LAST 90 DAYS	15	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	1

SUMMARY REPORT:

Several ultralight pilots had planned a flight from Prince Albert, Saskatchewan to a lake located 30 miles north of the city. An instructor and student pilot were conducting the flight in a Birdman Chinook ultralight which had dual controls. The instructor observed an aircraft on the same course at a lower altitude, and he commenced a right turn to descend and join the other aircraft. After starting the turn to the right, the pilot found that the ultralight continued in the turn which he could not stop. After ensuring that the student was not inadvertently applying rudder, the pilot used engine power and aileron controls in an attempt to reduce the turn rate and land on a highway. Just before landing, the left wing of the ultralight contacted some trees beside the road, and the aircraft struck the ground and came to rest in an inverted nose-down attitude. The pilot was seriously injured, and the student received minor injuries.

The ultralight had been purchased in kit form and assembled by the owner and some friends. The accident flight was the first flight of the aircraft, and no dual inspection of the primary flight or powerplant controls had been carried out.

The pilot was a qualified ultralight instructor. The weather conditions were suitable for the flight, and the weight and centre of gravity were within the prescribed limits.

A post-crash inspection of the flight controls revealed that the pilot's right rudder pedal cable attachment bolt had been installed without a safetying device. The corresponding bolt for the left rudder pedal was missing, and no evidence could be found to indicate that the bolt had been in place and had failed at impact. A bungee cord is used to interconnect left and right rudder pedals, and it applies tension to the rudder cables.

The aileron, elevator, and engine controls were found to be correctly installed and safetied. The fixed and movable flight surfaces and trim tabs had been assembled to the manufacturer's specifications. Maintenance and repair standards have not been established for ultralight aircraft, and no post-assembly inspections are required by regulation.

With the left pedal disengaged from the system, tension could not be applied to the left rudder cable in order to reposition the rudder and re-establish directional control. Air flow over the rudder would act to move the rudder to a neutral condition, and it could not be determined what effect bungee tension exerted on the system.

The dual control system could have been used by the student to neutralize the rudder, but, as neither the pilot nor the student knew what was causing the uncontrolled right turn, neither thought to have the student attempt to apply left rudder.

FINDINGS:

Cause Related:

1. The pilot's left rudder pedal bolt failed to remain in position because it was not safetied after installation.

2. The pilot's left rudder control inputs were lost when the pedal was disengaged from the system.

3. The right turn could not be stopped by the pilot.

Other:

1. The student pilot could have used his rudder controls to regain control of the aircraft.

2. The aircraft was flying without the benefit of a flight and powerplant control inspection prior to flight. Maintenance and repair standards have not been established for ultralight aircraft. There is no civil or government agency charged with the responsibility to inspect and ensure that ultralight aircraft are in a fit and safe condition prior to flight.

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BENSEN B8C (Gyrocopter) C-GFOZ
BRANTFORD AIRPORT, ONTARIO 1/2 mi N
21 MARCH 1987

REPORT NUMBER: 87-O/70018 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1740 EST
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private Gyroplane

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	183	183
LAST 90 DAYS	7	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

HISTORY OF THE FLIGHT:

The pilot was on a local pleasure flight. After being airborne for about 30 minutes, the gyrocopter was observed to nose over, descend, and strike the ground tail first in an inverted attitude. The pilot was fatally injured on impact.

PERTINENT INFORMATION:

The weather at the time of the accident was reported as visual flight rules (VFR) with ceiling and visibility unlimited and light winds. There was no report of turbulence or any other environmental conditions which would have adversely affected the flight.

Post-mortem examination of the pilot did not reveal any pre-impact injury or incapacitation.

The pusher propeller was a custom-made prototype. It had been manufactured from laminated basswood for the purpose of determining the correct airfoil section and pitch prior to manufacturing a second propeller from maple for subsequent use. The pilot had decided to continue to use the prototype pusher propeller and, because of the type of wood used in its construction, had conducted a detailed examination before each flight.

The pusher propeller had not shown any defect prior to this flight; however, on the accident flight, it had failed catastrophically after about 30 minutes of operation. Pieces of the propeller were found over a large area of the flight path, well before the point of impact.

It was determined by laboratory analysis that the laminations were not properly glued and that the basswood was not appropriate for use as a propeller.

ANALYSIS:

The failure of the pusher propeller was due to the use of unsuitable materials and improper gluing. The failure created an imbalance which caused severe vibration and resulted in a loss of control. It could not be determined if the loss of control was due to control problems caused by the severe vibration, or due to the effect of the vibration on the main rotor, causing a loss of lift.

FINDINGS:

Cause Related:

1. The pusher propeller failed because it was not properly glued and was built from unsuitable materials.

2. The pusher propeller experienced a sudden catastrophic failure which resulted in a loss of control of the gyrocopter.

3. Pre-flight examination of the pusher propeller did not show a defect which would have warned the pilot of the impending failure.

Other:
-Nil-

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AVIATION NORMAND DUBE AERO CRUISER
(Ultralight) C-IGSU
TERREBONNE, QUÉBEC
25 MARCH 1987

REPORT NUMBER: 87-Q75001 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1215 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	52	52
LAST 90 DAYS	12	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

After take-off on a local area pleasure flight, the pilot could not control the aircraft's ailerons. He elected to carry out a forced landing and initiated a shallow descent. The aircraft struck the ground in a slightly left-wing-down attitude, and the aircraft was substantially damaged. The pilot escaped uninjured.

The weather at the time was good with unlimited ceiling and visibility, and the wind was light. The pilot did not carry out a flight control check prior to the take-off. Once airborne, the pilot realized that the the ailerons could not be moved because the aileron control lock was left in place; however, he was unable to remove the lock. The pilot did not consider yaw as an alternate means of roll control.

The aileron control lock, which is located above and behind the pilot's right shoulder, consists of a bolt inserted through a bellcrank. The control lock was not equipped with a high visibility warning flag. The aluminum bellcrank was deformed around the bolt holes, indicating that substantial aileron control inputs had been made while the control lock bolt was inserted. The control lock is designed to prevent the ailerons from moving.

In flight, the control lock prevented the pilot from moving the ailerons, and the ensuing forced landing was therefore made with limited control.

FINDINGS:

Cause Related:
1. The pilot attempted to fly the aircraft without removing the aileron control lock; as a result, the aircraft was uncontrollable in flight.

2. The pilot did not carry out a flight control check prior to take-off.

Other:
1. The aircraft aileron control lock was not equipped with a high visibility warning flag to ensure pilot awareness of the lock, thereby permitting attempted flight with the control lock bolt installed.

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CANAERO DYNAMICS TOUCAN (Ultralight)
C-IHMB
NORTH BAY, ONTARIO
28 MARCH 1987

BRIEF NUMBER: 87-O/75001 (Accident)
LOCAL TIME: 1516 EST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	463	26
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot landed the ski-equipped aircraft on the hard-packed snow beside the runway. During the roll-out, the nose fork broke, and the aircraft nosed down into the snow. As the tail of the aircraft reared slightly, the left main landing gear spring strut separated, and the aircraft came down on the left wing.

The aircraft had been operated from the rough surface of Trout Lake during the winter. The pilot indicated that the nose fork may have been damaged because of the rough conditions.

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VOLKSPLANE VP-2-65 (Amateur-built) C-GEQL
CARLYLE, SASKATCHEWAN
05 APRIL 1987

BRIEF NUMBER: 87-C70017 (Accident)
LOCAL TIME: 1100 CST
OPERATION: Private Training
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	120	2
LAST 90 DAYS	5	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot was carrying out touch-and-go landings to become familiar with his recently purchased, tail-wheel-equipped, amateur-built aircraft. He had little experience with tail-wheel aircraft and was landing in a 10-knot 90-degree cross-wind. Following touchdown, the pilot lost directional control, and the aircraft ground looped.

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SQUADRON AVIATION INC. SPAD XIII (Ultralight) C-IGAF
WYOMING, ONTARIO
17 APRIL 1987

REPORT NUMBER: 87-O/75002 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1120 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	259	8
LAST 90 DAYS	1	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot took off on a local flight from a private aerodrome. On climb-out, the ultralight biplane aircraft entered a series of pitch oscillations which the pilot was unable to control, and the aircraft struck trees off the end of the runway to the right of the runway center line.

The design of the biplane wing is such that the upper wing loses lift before the lower wing when the wings approach the stall angle. The loss of lift causes the aircraft nose to pitch down, and, if proper stall recovery is not initiated by reducing the angle of attack, the wing will continue to stall and unstall, thereby producing an uncontrolled pitch oscillation as the aircraft loses altitude.

These oscillations occurred at low altitude and with obstructions in the flight path which undoubtedly deterred the pilot from reducing the angle of attack. The aircraft continued to oscillate and lose altitude until it struck the trees.

FINDINGS:

Cause Related:
1. The ultralight aircraft began a series of uncontrolled pitch oscillations on climb-out when the wing stalled.

2. As the aircraft wing stalled and recovered, altitude was continually lost.

3. Proper stall recovery was not initiated, causing the aircraft to lose altitude until it struck trees.

Other:
-Nil-

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BENSEN (Gyroplane, Amateur-built) C-GBEP
SOUTH RIVER/SUNDRIDGE AIRPORT, ONTARIO
18 APRIL 1987

BRIEF NUMBER: 87-O/70031 (Accident)
LOCAL TIME: 1015 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	111	2
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

Just after the gyroplane became airborne, the pilot noticed that an extra amount of right rudder was required to keep the aircraft straight. He climbed slowly to 10 feet above ground for a control check. Suspecting the problem was the result of overcontrolling, the pilot released the control stick, and the gyroplane promptly climbed. At 40 feet above the ground, the pilot levelled out and experienced more control difficulty while attempting a right turn. A left turn was initiated back to the runway. The pilot attempted to apply full power while turning; however, he inadvertently pulled the power off for a brief moment. The gyroplane lost altitude quickly and settled heavily onto small brush near the runway.

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CAVALIER SA102-5 C-GITP
DELTA AIR PARK, BRITISH COLUMBIA
19 APRIL 1987

REPORT NUMBER: 87-P70019 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1350 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	250	1.5
LAST 90 DAYS	15	1.5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The aircraft carrying the pilot and a passenger, who was the owner, made a normal landing on the grass strip. During the landing roll-out, the pilot reported hearing a snapping sound when the brakes were applied; the left rudder pedal then moved forward freely, and the left brake became ineffective. The aircraft swung to the right and came to rest in a shallow ditch beside the runway. The left main gear leg failed at the wing attachment weld when the wheel struck the ditch.

The rudder pedal assembly, which was from a Cessna 150, had been modified by moving the bellcrank arms to the centre of the pedal assembly. A piece of metal had been welded onto the bellcrank arms, thereby extending them two and one-half inches, and the rudder cables were attached to these extensions. The joint between the bellcrank and the extension was welded on one side only and was therefore inadequately fused. Examination of the aircraft revealed that the left rudder bellcrank arm had failed at the weld of the extension.

Maximum loading on the bellcranks occurs when both brake pedals are depressed; in this case, it is possible that the braking was heavier than normal, causing the bellcrank to fail at the weld.

With the left rudder pedal disconnected, the pressure on the right brake was transmitted to the right rudder as well, causing the pilot to lose control of the aircraft as it swung to the right.

The attachment weld of the left main gear failed because of a poor quality weld.

FINDINGS:

Cause Related:
1. The left rudder bellcrank arm failed in overload as a result of a poor weld.

2. The landing gear attachment failed because of a poor quality weld.

Other:
-Nil-

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VOLMER VJ22 SPORTSMAN (Amateur-built)
C-GJDY
COMOX, BRITISH COLUMBIA
24 APRIL 1987

BRIEF NUMBER: 87-P70022 (Accident)
LOCAL TIME: 1526 PST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Airline Transport

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,700	1
LAST 90 DAYS	150	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The pilot had just bought the tail wheeled, amphibious, amateur- built aircraft and was taking off from runway 36 at Comox. The wind was from 80 degrees at 5 to 15 knots, and the pilot cross- controlled to compensate for the cross-wind. The aircraft became airborne, drifted left, and the left wing float contacted the ground 20 feet to the left of the runway. The twisting action of the left wing float contacting the ground cracked the rear wing spar. The pilot cites lack of "tail dragger" experience or training as the cause of the accident.

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CU NIM GLIDING CLUB
SCHWEIZER 2-33A (Glider) C-GMOG
BLACK DIAMOND, ALBERTA
25 APRIL 1987

BRIEF NUMBER: 87-W70020 (Accident)
LOCAL TIME: 1615 MDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,650	500
LAST 90 DAYS	4	-

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	2
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

A club member pilot was receiving a seasonal check-out with a gliding instructor. On joining the circuit, the pilot flew the glider to a position approximately three-quarters of a mile opposite the intended touchdown point at a height of about 500 feet above ground level (agl). An area of subsiding air was encountered, and a turn to base leg was completed at approximately 200 feet agl at a speed of about 45 mph. The turn onto final was made at below 100 feet agl and the airspeed had dropped to 40 mph. A barbed wire fence was situated across the approach path near the touchdown end of the runway. Concerned that the glider could not be flown over the fence, the instructor took control and initiated a left turn in an attempt to land parallel to the fence in an open field. During the turn, the left wing struck the ground, and the glider swung through 90 degrees and slid sideways.

During the flight, the wind was blowing at approximately 15 knots. There was some light thermal activity and some areas of subsiding air. The weather was not considered a factor in this accident.

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FISHER FLYING PRODUCTS INC. FP-101
(Ultralight) C-ICMA
BROCKWAY, NEW BRUNSWICK
25 APRIL 1987

REPORT NUMBER: 87-A75001 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2015 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	75	9
LAST 90 DAYS	6	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was flying circuits in his recently constructed aircraft. On the downwind leg, at an altitude of approximately 800 feet above ground level, the engine (Kawasaki TA-440A) suddenly stopped. The pilot immediately turned the aircraft toward the airport in an attempt to land on the airport tarmac. During the approach, the pilot realized that the aircraft would not clear power lines on the approach path. He lowered the nose of the aircraft in an attempt to go under the wires, but the right wing struck a tree, causing the left wing to rise and contact the wires. The aircraft swung 90 degrees to the right and crashed heavily in a nose-down attitude onto a highway at the edge of the airport. The pilot received a cut on his chin when his face struck the instrument panel.

Examination of the aircraft's engine revealed that the rear piston had seized in the cylinder as a result of inadequate lubrication. Laboratory analysis of the fuel/oil mixture used in the aircraft showed that it had a mixture ratio of between 111:1 and 118:1, using Amsoil, a synthetic oil manufactured in the United States by Amsoil Inc. The instructions on the oil container stated that the contents of the container should be mixed with six gallons of gasoline to obtain the required mixture ratio of 100:1; however, the instructions did not specify U.S. gallons. When the aircraft was refuelled before the accident flight, the contents of the oil container were mixed with six Imperial gallons of gasoline, giving a fuel/oil ratio of 115:1.

The drawings and assembly instructions supplied by the aircraft kit manufacturer provide for seat-belt attachment points; however, the type of seat-belt and hardware used to attach the seat-belt is left up to the builder.

On this aircraft, the seat-belt was attached to the airframe attachment points with steel ring clips. The right ring clip straightened out during the crash, allowing the seat-belt to become detached. An examination of the ring clips determined that they would yield when a force of 340 pounds was applied to them. The G force produced in this accident was calculated to be 2.5 Gs. Chapter 523.561 of the Airworthiness Manual states that a seat-belt assembly must be able to withstand a forward inertia force of 9.0 Gs. The steel ring clips used to attach the seat-belts did not conform to this standard, nor are they required to do so under the existing regulations governing ultralights.

The mixture ratio of 115:1 used in the fuel for the accident flight did not provide adequate lubrication, and, as a result, the engine seized. During the subsequent forced landing, one of the steel ring clips holding the pilot's seat-belt failed, allowing the pilot to be thrown against the instrument panel.

FINDINGS:

Cause Related:

1. The instructions on the oil container did not specify whether the gallons referred to were U.S. or Imperial; this resulted in an incorrect fuel/oil mixture ratio of 115:1 being used in the aircraft engine instead of the 100:1 ratio specified by the oil manufacturer.

2. The engine seized because of inadequate lubrication as a result of the incorrect fuel/oil mixture ratio.

3. One of the steel ring clips used to attach the pilot's seat-belt failed during the accident.

Other:

1. The steel ring clips used to attach the pilot's seat-belt did not conform to airworthiness standards nor are they required to do so under the existing ultralight regulations.

* * *

GRADY 2/3 SCALE P40-M (Amateur-built)
C-FGAM
EDMONTON MUNICIPAL AIRPORT, ALBERTA
26 APRIL 1987

REPORT NUMBER: 87-W70021 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1615 MDT
OPERATION: Private Testing
DAMAGE: Substantial
PILOT LICENCE: Commercial

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,200	0
LAST 90 DAYS	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was conducting the first flight on the newly constructed amateur-built aircraft. The flight was to consist of lifting off, flying a short distance just above the runway, and then landing on the remaining runway. On take off, the pilot applied partial power, raised the tail, and when the aircraft felt ready to fly, lifted off and flew along the runway at an altitude of about 10 feet. Two thousand feet from the end of the runway, he slowly reduced power to allow the aircraft to settle for a three-point landing. Just before touchdown, the left wing dropped abruptly and struck the runway. The aircraft landed heavily and swung to the left, off the side of the runway. As the aircraft came onto the grass, it was sliding sideways to the right, causing both main gear to collapse.

The pilot had been flying for over 40 years and was experienced in flying amateur-built World War II type replica aircraft, as well as his own P-51 Mustang; however, he had not flown in the last six months.

Workmanship on the aircraft was of high quality, and no discrepancies were found that would have contributed to the occurrence.

The aircraft had never been flown before, and, therefore, no stall or approach speeds had yet been established, nor had the stall characteristics of the aircraft been determined. During the short period of time that the aircraft was airborne, the pilot was checking engine instruments. The airspeed indicator was not monitored during the flight or landing approach.

The weather was clear with a 90-degree cross-wind from the left of three to seven knots.

While attempting the three-point landing, the pilot inadvertently allowed the airspeed to decrease to the stall, causing the left wing to drop suddenly just before touchdown, and the aircraft made a hard landing.

FINDINGS:

Cause Related:

1. The pilot had not flown for six months before the accident flight.

2. The airspeed was not monitored during the flight and was allowed to decrease.

3. The pilot attempted a three-point landing without having first determined the stall speed and stalling characteristics of the aircraft.

4. The left wing dropped suddenly when the aircraft stalled, and the aircraft made a hard landing.

Other:

-Nil-

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SOSA GLIDING CLUB
BURKHART GROB G102 ASTIR (Glider) C-GSOD
ROCKTON, ONTARIO
26 APRIL 1987

BRIEF NUMBER: 87-O/70030 (Accident)
LOCAL TIME: 1810 EDT
OPERATION: Flying Club Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	194	10
LAST 90 DAYS	1	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The tow rope was connected to the glider; however, the glider pilot had not completed his cockpit check, the wing runner and signal men were not in position, and the tire used to weigh the left wing down had not been removed. The tow aircraft began to move forward. The glider pilot released the tow, but was unable to stop the glider before it swung left and struck a retrieve vehicle parked beside the runway.

The tow pilot was not aware the tow rope had been connected to his aircraft. He was not intending to take off but was taxiing to the refuelling area when he moved his aircraft.

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DURAN MARK 5 (Amateur-built) C-GTRR
STE-THÉRÈSE AIRPORT, QUÉBEC
05 MAY 1987

REPORT NUMBER: 87-Q70010 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2010 EDT
OPERATION: Private Ferry
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	253	4
LAST 90 DAYS	6	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The newly purchased amateur-built aircraft, with the owners on board, was on its fifth and final leg of the ferry flight to Ste-Thérèse, Québec. The pilot in the left seat was at the controls. At destination, following the round-out with 45 degrees of flap and the power at idle, the aircraft contacted the runway in a three-point attitude. Shortly after, a noise was heard from the right side. The right wing then came up, and the bottom left wing contacted the paved surface of the runway. The aircraft veered right, then left. The pilot used the rudder, but the aircraft yawed again to the right and finally came to rest on the grass beside the runway, facing in the opposite direction.

The approach was made with a light tail wind. The centre 30 feet of the runway is paved and composed of a deteriorated asphalt surface. There were some pot-holes in the touchdown area. No Notice to Airmen (NOTAM) had been issued to indicate the condition of the runway. Traces showed that, on touchdown, the right wheel of the aircraft rolled through a deteriorated portion of the asphalt runway. Examination of the aircraft did not reveal any pre-occurrence malfunction or failure. On contact with the paved surface, the bottom part of the left wing buckled, which rendered the aileron controls ineffective. Rudder control is normally sufficient to control the aircraft during the landing phase. The pilot was familiar with the airfield but had limited experience on this type of aircraft.

During the landing on the deteriorated runway, the right wing came up, causing the lower left wing to contact the runway surface, bending and rendering the aileron controls ineffective. The aircraft then swung in both directions, and the pilot was unable to regain control of the aircraft on the narrow paved surface. The aircraft came to rest off the runway.

CONCLUSIONS:

Findings:
1. A portion of the paved surface of the runway had deteriorated, and pot-holes were present in the touchdown area.

2. No NOTAM had been issued to indicate the condition of the runway.

3. On landing, the right wheel of the aircraft rolled through a pot-hole on a deteriorated portion of the runway, causing the pilot to lose control of the aircraft.

4. The pilot was unable to regain control of the aircraft.

Causes:
The pilot was unable to regain control of the aircraft after the right wheel rolled through a deteriorated part of the narrow runway on landing.

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PEGASUS XL-R (Ultralight) C-IEFT
ASHCROFT, BRITISH COLUMBIA
09 MAY 1987

REPORT NUMBER: 87-P75002 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1450 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5	5
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The ultralight was trailered to the Ashcroft Airport, British Columbia, where it was prepared for a local pleasure flight. The wing was assembled by following a printed batten plan to ensure that the battens that formed the wings were properly shaped.

Approximately 15 minutes after take-off, while overflying the Thompson River valley, the pilot encountered gusty winds and moderate turbulence. The battens attached to the right wing began to slap against the wing washout tube. The ultralight then developed a tendency to turn to the right which increased to the point that the pilot became tired from trying to control the aircraft, and he decided to return to the airport. As the pilot rounded the aircraft out at 60 mph, an uncommanded steep turn to the right headed the ultralight back over the valley.

The pilot then decided to land on a paved racetrack on the valley floor. As the pilot again attempted to round out at 60 pmh, the ultralight started to turn to the right, and the right wing tip struck the ground. The ultralight cartwheeled to a stop, and the pilot was seriously injured.

The wing is constructed by stretching dacron fabric over an aluminum tubular frame. The fabric is held in an airfoil shape by aluminum tubular wing battens that have been bent into a pre-shaped arc. The second batten from the right wing tip had been bent out of the airfoil shape twice before. It could not be determined what had caused the batten to bend previously. On both occasions, the pilot had also experienced uncommanded right turns. After the batten had been straightened, the ultralight flew in a normal manner.

The pilot, who had limited flight experience, thought that the right turn was caused by the turbulent conditions and did not conduct a low speed controllability check. To overcome the effects of the turbulence, the aircraft was flown at 60 mph while on final approach. The manufacturer's recommended landing speed is 30 to 35 mph.

The uncommanded right turns experienced by the pilot indicate that one or more of the right wing battens had become bent from slapping against the washout tube during flight in the turbulent conditions. This reduced the angle of attack and the lift on that wing. Turning forces therefore increased with the increased airspeed and angle of attack. Thus, when the pilot attempted to round out for landing at a high airspeed, the ultralight turned to the right. Since the pilot was tired, he was unable to compensate for the resulting high turning forces at the higher approach speed. Had the pilot attempted to land at the recommended airspeed, both control and turning forces would have been reduced, and it is possible that a safe landing could have been completed.

The strength of the right wing batten had been reduced by the previous bending and straightening processes. This reduction in strength allowed the batten to become bent by the turbulence.

FINDINGS:

Cause Related:

1. The right wing batten became bent due to the turbulent air and caused the ultralight to enter uncommanded turns to the right.

2. The pilot attempted a landing at a higher than recommended airspeed and was unable to control the right turn.

Other:
-Nil-

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AIR CADET LEAGUE OF CANADA
SCHWEIZER SGS2-33A (Glider) C-GCLF
DEBERT AIRPORT, NOVA SCOTIA
09 MAY 1987

REPORT NUMBER: 87-A70011 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1530 ADT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	36	N/A
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	1

SUMMARY REPORT:

During an auto tow, the glider became airborne and started to climb at about 45 mph. The pilot lowered the nose and rocked the wings to give the too slow signal. The tow vehicle driver increased power, and the pilot observed the speed increase to 50 mph. She then raised the nose slightly and, at an altitude of 50 feet, noticed slack in the tow rope. She started to lower the nose again, but at approximately the same time, it dropped suddenly. The pilot released the tow rope, and the glider struck the runway heavily in a nose-down attitude. The passenger, seated in front, was not injured. The pilot received serious back injuries.

The initial take-off and climb at 45 mph was 10 mph slower than the proper speed. When the too slow signal was given, the acceleration of the truck did not provide the additional speed necessary. The aircraft was nearly stalled, and, when the pilot raised the nose to resume the climb the aircraft stalled. There was insufficient altitude remaining to effect a recovery.

FINDINGS:

Cause Related:

1. The pilot initiated a climb at 45 mph when the speed should have been 55 to 60 mph.

2. After the too slow signal was given, the tow vehicle did not provide enough power and/or speed to accelerate the glider properly.

Other:
- Nil -

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CAMERON BALLOONS CANADA LTD.
CAMERON A-140 (Balloon) C-GVIX
CROSSFIELD, ALBERTA 6 mi SW
17 MAY 1987

BRIEF NUMBER: 87-W70031 (Accident)
LOCAL TIME: 0910 MDT
OPERATION: Specialty Recreational Flying
DAMAGE: None
PILOT LICENCE: Balloon

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,450	1,450
LAST 90 DAYS	47	47

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	1	3

REPORTED CIRCUMSTANCES:

The balloon was launched in conditions of light winds, clear skies, and good visibility. During the one hour and twenty minute flight, the surface winds increased steadily to between 30 and 35 knots. On landing one passenger sustained a broken ankle. The increase in wind speed had not been predicted in the weather forecast.

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ROBERTSON B1-RD (Ultralight) C-IBAD
LANGLEY AIRPORT, BRITISH COLUMBIA
17 MAY 1987

REPORT NUMBER: 87-P75001 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1148 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	200	200
LAST 90 DAYS	4	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot of the ultralight was participating in a rally and was the fifth of 20 ultralights to take off from runway 07 at Langley Airport, British Columbia. To avoid overflying runway 19 which was also in use, the departing ultralights were required to turn left before reaching the end of the 2,300-foot grass strip. After a 200-foot take-off run, the accident ultralight started to climb at an airspeed varying between 22 and 25 mph. After travelling a further 800 feet while at an altitude of about 50 feet above ground level (agl), the ultralight commenced a left turn. The ultralight then appeared to stop climbing and suddenly spun right in a steep nose-down attitude and struck the ground. The pilot was seriously injured.

The ultralight was heavily loaded with two extra pod fuel tanks mounted under the wings as well as a ballistic parachute. The gross weight of the ultralight was calculated to be 45 pounds over the maximum allowable weight of 430 pounds. The overweight condition resulted in an increase in the stall speed and a decrease in the climb performance. Witnesses reported that the accident ultralight climbed much slower than the other ultralights.

The weather was clear with a light and variable wind. At the time of the take-off, the wind was blowing from 180 degrees at about five knots.

The pilot's licence validation certificate had expired on 01 July 1986.

The heavily loaded ultralight required 800 feet to climb to an altitude of 50 feet. When the ultralight turned to the left, the increase in ground speed caused by the tail wind created an illusion of a higher airspeed. When the pilot noted that he had stopped climbing, he attempted to compensate for this by increasing the angle of attack without first verifying the airspeed. The airspeed decreased, and the ultralight stalled and spun to the ground before a recovery could be effected.

FINDINGS:

Cause Related:
1. The pilot did not maintain flying speed during a downwind turn, and the ultralight stalled and spun to the ground before control could be regained.

Other:
1. The pilot's licence validation certificate had expired.

2. The aircraft's maximum allowable weight was exceeded by 10 per cent.

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LAZAIR (Ultralight) C-IBLJ
ALEXANDRIA AIRPORT, ONTARIO
20 MAY 1987 (Approximately)

BRIEF NUMBER: 87-O/75003 (Accident)
LOCAL TIME: Unknown
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Unknown

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	Unknown		
PASSENGERS	Unknown		

REPORTED CIRCUMSTANCES:

The aircraft owner reported that the aircraft was substantially damaged by an unknown, unauthorized user some time between 20 and 23 May 1987. Marks found on the runway indicate an attempt to fly the aircraft was made, at which time it was damaged. It was then placed back on the tie-down at the airport.

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PAZMANY PL4 (Amateur-built) C-GXQQ
INDUS, ALBERTA 6 mi SSW
24 MAY 1987

REPORT NUMBER: 87-W70030 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1500 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	1,200	688
LAST 90 DAYS	13	13

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was on a local recreational flight in his amateur-built aircraft. The take-off was being made into a 25-knot wind which was gusting and variable in direction. Just after lift-off and about five feet above the ground, the aircraft began to drift to the right. While the pilot was attempting to correct the drift, a gust of wind lifted the left wing, and the right wing dropped and contacted the ground. The aircraft struck the ground, the landing gear collapsed, and the aircraft came to rest in an upright position.

When the right wing tip contacted the ground, the pilot lost directional control, and the aircraft struck the ground with enough force to collapse the landing gear.

FINDINGS:

Cause Related:
1. During a take-off in gusty wind conditions, the right wing tip contacted the ground, causing the pilot to lose directional control.

Other:
-Nil-

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BIRDMAN CHINOOK 2S (Ultralight) C-IEYG
MORINVILLE, ALBERTA 10 mi N
27 MAY 1987

BRIEF NUMBER: 87-W75002 (Accident)
LOCAL TIME: 1100 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	26	26
LAST 90 DAYS	12	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was flying at 600 feet above ground level when the engine suddenly lost power. The pilot attempted a forced landing in a field, but undershot the intended landing area. The aircraft touched down in a slough and was substantially damaged. The wind was blowing at four knots or less and the sky conditions were clear.

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BEAVER RX550 TWO (Ultralight) C-IHRX
FORESTVILLE, QUÉBEC 12 mi N
06 JUNE 1987

BRIEF NUMBER: 87-Q75003 (Accident)
LOCAL TIME: 1950 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private (Ultralight)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	60	40
LAST 90 DAYS	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was practising touch-and-go landings on a lake. During the third landing, the ultralight encountered a gust of wind, and the left float contacted the water. The pilot applied full power and maximum right aileron, after which the right wing struck the water. The pilot stopped the aircraft and inspected it but found nothing amiss. On the following take-off, the ultralight was unable to get airborne; however, a second attempt was successful following a longer than usual take-off run. Once airborne, the pilot checked the aircraft flying characteristics and noticed that the ultralight right wing had a tendency to drop. At approximately 300 feet above the lake surface, the pilot initiated a left turn to return for landing. During the turn, the aircraft stalled and crashed into the trees. The pilot escaped uninjured.

When the aircraft initially struck the water, the right wing was deformed, and water entered the right float.

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ULTRAVIA PELICAN CLUB (Ultralight) C-IHBA
BAIE-COMEAU, QUÉBEC 10 mi E
07 JUNE 1987

REPORT NUMBER: 87-Q75002 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2030 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	5,200	70
LAST 90 DAYS	75	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot had departed from Pentecote, Québec, on a pleasure flight to Baie Comeau, Québec. While the aircraft was at cruise altitude, the engine (Bombardier/Rotax 532) vibrated excessively and lost partial power. The pilot decided to attempt an emergency landing on a highway 10 miles east of Baie-Comeau. On final, the pilot manoeuvred the aircraft to avoid a vehicle, and the aircraft struck a power line crossing the road and crashed.

Two days before the accident, the pilot had made a precautionary landing on a road because the engine had been vibrating excessively, and he noticed at that time that the aluminum propeller spinner had become loose and had pulled out of most of its attaching screws. He removed the spinner; however, the spinner mounting plate was left on the aircraft. Before the accident, the aircraft had flown approximately four hours with the propeller spinner removed.

The spinner had previously been installed by the owner of the aircraft. The hardware supplied by the kit manufacturer (screws and back plate) was not used, and the installation instructions were not followed.

Examination of the aircraft revealed that an aluminum doubler was welded to the spinner mounting plate and that the four weld tacks were of unequal length and unequal weight around the circumference. The installation bolt holes were not precision drilled in the spinner mounting plate. The plate showed an out-of-balance condition from the initial installation. Also, the rubber carburettor mounting pads were both cracked, and one allowed unmetered air to be admitted into the engine.

The out-of-balance spinner mounting plate caused the engine to vibrate, and, as a result, the carburettor mounting pads cracked. The admission of the unmetered air through the cracked carburettor's rubber mounting pads into the engine intake manifold resulted in a very lean air/fuel mixture and caused the engine to lose partial power. During the emergency landing, the aircraft contacted a power line crossing the road when the pilot had to avoid a vehicle on the highway.

FINDINGS:

Cause Related:

1. The propeller spinner assembly was out of balance because the spinner mounting plate had not been properly tack welded and the bolt holes had not been properly drilled.

2. The out-of-balance propeller spinner assembly caused the engine to vibrate, and, as a result, the carburettor mounting rubber pads cracked.

3. The cracked carburettor rubber mounting pads allowed unmetered air to enter the intake manifold and resulted in the subsequent loss of engine power.

4. The spinner had not been installed in accordance with the manufacturer's instructions.

Other:
-Nil-

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SPECTRUM RX35 BEAVER (Ultralight) C-IHUM
KING GEORGE HIGHWAY,
SURREY, BRITISH COLUMBIA
07 JUNE 1987

REPORT NUMBER: 87-P75003 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1630 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	54	41
LAST 90 DAYS	42	41

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The ultralight pilot was returning to his home airstrip after a four and one-half hour flight. Just after the pilot had joined the downwind leg of the circuit, the ultralight's engine (Rotax 447) stopped. The pilot turned the aircraft to the left in order to force-land in a meadow. During the turn, the airspeed decayed, and the aircraft stalled and spun onto a highway. The pilot received serious injuries.

During the examination of the wreckage, the carburettor was found to contain no fuel. This aircraft had two fuel tanks: one forward tank and one in the rear. The forward tank was higher and gravity fed into the rear tank; the rear fuel tank contained about one-half gallon of fuel. However, this fuel was unusable whenever the ultralight was in a nose-low attitude, as on descent, because the fuel pickup line to the carburettor was situated at the rear of the tank.

A shoulder harness was not installed, nor was such an installation required by regulation.

The pilot misjudged the amount of fuel on board, and the engine stopped because of fuel exhaustion. During the attempted forced landing, the pilot allowed the airspeed to decay until the ultralight stalled.

FINDINGS:

Cause Related:
1. The pilot misjudged the amount of fuel available, and the engine stopped because of fuel exhaustion.

2. The pilot allowed the ultralight to stall.

Other:
-Nil-

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A.M.F. – S14 (Amateur-built) C-GPXI
MINESING, ONTARIO
13 JUNE 1987

REPORT NUMBER: 87-O/70047 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1330 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	205	19
LAST 90 DAYS	0	0

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

SUMMARY REPORT:

The aircraft was landing in calm wind conditions on a well-maintained, private grass runway. During the landing roll-out, the tail-wheel-equipped aircraft started to pitch nose-down. The pilot attempted to counter the pitching moment with full-up elevator, and the aircraft nosed over.

No pre-impact malfunctions or failures of the aircraft's flight controls or structure were found. The aircraft's weight and centre of gravity were within the prescribed limits. The pilot carried out a full-flap wheel landing and was not applying brakes during the roll-out. Immediately after the accident, the aircraft's wheels were checked for freedom of movement, and both wheels rotated satisfactorily.

In an attempt to determine why the aircraft pitched down, and nosed over, investigators researched the possibility of the flaps interfering with the airflow over the elevators and reducing their effectiveness at low speeds. Since there are only a few of these aircraft in Canada, no technical data are available on the flight characteristics of the aircraft. However, Transport Canada has not received any complaints in this regard, and the owner/builder of the aircraft reported that he had never had any problems in the past with the aircraft's flight controls. It could not be determined why the aircraft pitched down and nosed over during the landing roll.

FINDINGS:

Cause Related:
1. During the landing roll, the aircraft pitched down and nosed over for undetermined reasons.

Other:
-Nil-

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AERONCA CHAMPION 7AC (Floats) CF-JMA
ONAPING LAKE, ONTARIO
24 MAY 1987

REPORT NUMBER: 87-O/70037 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1220 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	500	4
LAST 90 DAYS	30	4

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	1	-

SUMMARY REPORT:

During the left turn from downwind onto a base leg the aircraft suddenly flicked to the right and pitched down. The aircraft struck the ground in a nose-down, right-wing-low attitude. The pilot and passenger were seriously injured.

The pilot had completed five successful take-offs and landings on the lake from the front seat prior to this approach. The owner of the aircraft was checking the pilot out from the rear seat. However, he had only rudder control as the rear control stick had not been installed prior to the flight because the clevis pin could not be found.

As the pilot descended onto the downwind leg he retarded the throttle and entered a steep left uncoordinated turn onto a base leg. Although the pilot does not recall the events leading up to the accident, the owner felt the airspeed was decreasing rapidly during the turn. Several witnesses reported seeing the aircraft enter a steep left turn, then flick to the right before it struck the ground.

The weather was not a factor. The wind at the time was less than 10 knots from the north. When the aircraft was examined no mechanical malfunctions were detected.

There were no shoulder harnesses installed in either the front or rear seats.

The pilot had flown this aircraft only once before. The day of the accident was the first time he had flown from the front seat. He had not practised slow-flight, stalls or spins on this aircraft type, therefore, was not familiar with the stall characteristics of the aircraft. As a result he did not recognize the indications of an approaching stall when he allowed the airspeed to decrease during a steep uncoordinated turn. The owner, checking the pilot out from the back seat, was not able to recover from the stall as the rear control stick had not been secured.

FINDINGS:

Cause Related:
1. The pilot was not familiar with the stall characteristics of this type of aircraft, and, as a result, did not recognize the indications of an approaching stall.

2. The aircraft stalled and the check pilot was unable to recover as the control stick in the rear seat had not been installed.

Other:
1. The aircraft was not equipped with shoulder harnesses.

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SASKATOON SOARING CLUB
SLEICHER KA6CR (Glider) C-FSHG
STRAWBERRY LAKE, SASKATCHEWAN
14 JUNE 1987

BRIEF NUMBER: 87-C70037 (Accident)
LOCAL TIME: 1325 CST
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Student (Glider)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	644	2
LAST 90 DAYS	4	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

After a short flight, the pilot entered the circuit to land on runway 08. The wind blowing from 150 degrees magnetic at 15 to 20 knots with gusts. Just prior to touchdown, a gust of wind lifted the right wing, and the glider drifted left. The left wing struck a wind sock pole to the side of the runway. Runway 08 was in use, but the pilot could have elected to land into wind on the airfield.

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VULMER JV-24W (Ultralight) C-IJAA
CHARLO, NEW BRUNSWICK
17 JUNE 1987

BRIEF NUMBER: 87-A75002 (Accident)
LOCAL TIME: 2030 ADT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	22	N/A
LAST 90 DAYS	1	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was carrying out a practice flight, and, after completing an approach to about one foot above the runway, he commenced an overshoot. At approximately 50 feet above ground level, the pilot started a right-hand turn, and the aircraft suddenly lost altitude. Unable to clear utility poles and power lines in the flight path, the pilot closed the throttle; the aircraft struck the ground with the left wing low and came to rest in an inverted position. The pilot did not closely monitor his airspeed while manoeuvring in restricted airspace.

The Canadian Aviation Safety Board investigated this occurrence for the purpose of advancing aviation safety. It is not the object of the Board to determine or apportion any blame or liability.

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BUSHMASTER II (Ultralight) C-IEKV
PRINCE GEORGE, BRITISH COLUMBIA 15 mi NW
17 JUNE 1987

REPORT NUMBER: 87-P75004 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 2020 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private (Expired)

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,000	20
LAST 90 DAYS	5	5

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot, with his daughter as passenger, took off from a private airstrip 15 miles northwest of Prince George, British Columbia at 2000 Pacific standard time (PST) for a pleasure flight. Witnesses on the ground observed the ultralight flying around the area just above tree-top level for 20 minutes. Two or three low passes were made along the airstrip. On the final low pass, the ultralight was seen to climb away to the west at low speed, and, when it was about 100 feet above the ground, the aircraft entered a steep climbing left turn, then stalled, and struck the ground.

Fire broke out within a few seconds of ground impact, and the two occupants received fatal injuries. Only the passenger wore a helmet.

PERTINENT INFORMATION:

Witnesses reported that the ultralight engine sounded normal until ground impact. No pre-impact failures or malfunctions were found. The accident occurred on a warm, clear, calm evening.

The pilot had about 2,000 hours of flying experience, more than half of it dating back to the Second World War. He had not received any ultralight training, and his private pilot licence, which was not endorsed for ultralight aircraft, had expired four years earlier when his licence validation certificate expired.

Witnesses, who had observed the pilot flying the ultralight on the previous few evenings, reported that he had consistently been flying low and making steep turns.

Most of the pilot's flying in this aircraft had been solo; however, he had flown both with his son and with the other part-owner of the ultralight as passenger, and he would have been aware of the reduced aircraft performance with two people aboard. Air Navigation Order Series V, No. 24, states in part that no person shall carry a passenger in an ultralight aeroplane except for the purpose of providing dual flying instruction to that person. If instruction is taking place, the person providing instruction must be the holder of a valid Ultralight Aeroplane Commercial Pilot Licence. The same Air Navigation Order also requires that each occupant of an ultralight aeroplane wear a protective helmet.

To fly an ultralight solo under day visual flight rules (VFR) conditions, the pilot must possess a Student Pilot Permit or a Private Pilot Licence endorsed for ultralight aircraft.

ANALYSIS:

The pilot made a steep climbing turn at low speed and altitude, and the ultralight stalled. There was insufficient altitude available in which to effect recovery.

The pilot had not received any training on ultralight aircraft.

CONCLUSIONS:

Findings:

1. The pilot had not received any training on ultralight aircraft.

2. The aircraft stalled while in a steep climbing turn at low speed.

3. The pilot was not wearing a protective helmet.

4. The pilot did not hold a valid pilot licence.

5. The pilot was carrying a passenger on board the ultralight.

Causes:
The pilot was attempting a steep turn during a climb at low airspeed when the aircraft stalled. The aircraft was at too low an altitude to effect a recovery.

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QUICK-SILVER MX UNREGISTERED
WONO WON, BRITISH COLUMBIA
19 JUNE 1987

BRIEF NUMBER: 87-W75003 (Accident)
LOCAL TIME: 1405 MDT
OPERATION: N/A
DAMAGE: N/A
PILOT LICENCE: None

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The ultralight aircraft crashed into a power line while the pilot was attempting to land. The pilot, who was seriously injured, was taken to hospital, and the aircraft was removed from the accident site by witnesses.

Repeated attempts by investigators and police to contact the pilot have been unsuccessful, resulting in a lack of information concerning this accident.

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OSPREY II (Amateur-built) C-GSMP
SHERWOOD LAKE, NEW BRUNSWICK
21 JUNE 1987

REPORT NUMBER: 87-A70018 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1616 ADT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	2,100	112
LAST 90 DAYS	15	15

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	1	-	-

HISTORY OF THE FLIGHT:

The pilot and his passenger boarded the aircraft to return to the airport at Saint John, New Brunswick, after a day-long fishing trip. Witnesses on the shore observed the aircraft take off, descend in a left turn, and then disappear behind nearby hills. This was followed by the sounds of the power being reduced and the aircraft striking the water and rocky shoreline.

PERTINENT INFORMATION:

The weather was clear, and the southwest winds at 20 to 25 mph were causing white-caps. The lake, which is at an elevation of about 200 feet, is bordered by hills that are 600 to 700 feet above sea level; the wind and terrain were creating downdrafts and turbulence in the lee of the hills.

The pilot taxied out 300 to 400 yards from the beach; he did not backtrack to use all the available distance for take-off. He turned into wind, and, when the aircraft was on the step, he did a 360-degree turn to the left, while completing an engine power check. When the aircraft came into wind again, the pilot completed a take-off to the southwest. After lift-off, the aircraft was observed to commence a steep, low-altitude, downwind turn back to the east toward the hills. The [illegible]ine sounded normal for a climb. As the aircraft disa[illegible]ared from the witness's view, it had started to descend. The witness then heard the power being reduced, followed by the sound of the aircraft hitting the water and immediately after the sound of the crash onto the rocky shore.

The aircraft had run into the rocky shore on an easterly heading and had come to rest floating in four feet of water, heading toward the south. The impact caused the pylon-mounted engine to collapse forward and pin the occupants in the cockpit. The pilot's head remained above water, but the passenger was forced below the surface.

The pilot was unable to recall any of the details of the flight. Although he recalled events earlier in the day, he could not remember anything that happened after he walked down to the beach to get into his aircraft.

The engine was removed and test run at an overhaul facility where it was found to be capable of normal operation.

ANALYSIS:

The 20 to 25 mph wind flowing over the hilly terrain was creating significant turbulence and downdrafts. In the lee of the hills close to the shore where the turn was attempted, the aircraft climb capability would have been reduced by the turbulence and downdrafts.

The aircraft departed into wind; however, as the low-level, downwind, steeply banked turn was commenced, the aircraft started to descend. The pilot probably knew that he did not have sufficient room to complete the turn to parallel the shoreline; so he closed the throttle and levelled the wings before landing. At touchdown, the rocky shoreline was immediately ahead, and the aircraft struck the shoreline in about a 45-degree angle.

CONCLUSIONS:

Findings:

1. A steep, low-level, downwind turn was attempted in an area surrounded by hilly terrain.

2. Turbulence and downdrafts in the lee of the hills were created by strong winds and hilly terrain.

3. Following an attempted landing, there was insufficient room in which to stop the aircraft; as a result, the aircraft ran into the rocky shoreline.

4. When the aircraft struck the shoreline, the pylon-mounted engine collapsed forward and pinned the passenger below the surface of the water.

5. The pilot does not remember the accident flight, nor does he recall any significant events prior to the accident.

Causes:
The pilot attempted a low-level, downwind, steep turn just after take-off in an area of high terrain, downdrafts, and turbulence. During the attempt to land, the aircraft struck the rocky shoreline because there was insufficient room in which to land.

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QUICKIE (Amateur-built) C-GMZE
HUMBOLDT, SASKATCHEWAN
21 JUNE 1987

REPORT NUMBER: 87-C70045 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 1110 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	245	192
LAST 90 DAYS	13	13

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The engine of the amateur-built aircraft provided normal power during the take-off roll; however, after lift-off, the power decreased to the point that the aircraft was unable to maintain altitude. The pilot carried out a forced landing in a field, and the aircraft was substantially damaged.

The two-cylinder engine (Onan) was examined after the accident, and one intake valve seat seal was found to be worn; no other faults were found. The worn seal caused loss of combustion pressure, which markedly reduced engine performance.

CONCLUSIONS:

Findings:
1. The valve seat seal was worn, causing loss of combustion pressure, resulting in reduced power output.

Causes:
The engine lost power because of a worn valve seat seal.

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VOLMER VJ-22 SPORTSMAN C-FCDH
FORT LANGLEY, BRITISH COLUMBIA
28 JUNE 1987

REPORT NUMBER: 87-P70041 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1130 PDT
OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	145	1
LAST 90 DAYS	3	1

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot had just purchased the Volmer VJ-22 Sportsman amphibious flying boat. Following approximately one hour of flying,in which two circuits were made over the airport, the pilot decided to make a low approach and overshoot. On final to runway 08, the airspeed was allowed to decrease, and the aircraft stalled and struck a fence. It then slid across a dirt road, struck a pile of drainage pipes, and nosed over. The pilot, who was wearing a shoulder harness, escaped uninjured.

The weather at the time was clear, and there were no restrictions to visibility. The winds were from 210 degrees magnetic at five knots.

The pilot had never flown this type of aircraft before. He had been unable to find anyone to give him dual instruction on the operation of the aircraft and had decided to teach himself. Being inexperienced on type, he did not recognize that the aircraft was about to stall, and he did not apply power nor reduce the angle of attack to prevent the onset of the stall.

FINDINGS:

Cause Related:
1. The pilot had not received dual instruction on the aircraft.

2. The pilot did not recognize the onset of a stall on final approach and lost control of the aircraft.

Other:
-Nil-

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LAZAIR (Ultralight) C-IALH
MELVILLE, SASKATCHEWAN
28 JUNE 1987

BRIEF NUMBER: 87-C75002 (Accident)
LOCAL TIME: 1520 CST
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Student Pilot Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	710	200
LAST 90 DAYS	10	10

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

While on a local pleasure flight in hot weather and calm winds, the pilot pulled up into a steep climb. At about 50 feet above ground level, the aircraft stalled then descended and struck the ground.

The recently installed shoulder harness most probably prevented serious injuries.

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SCHWEIZER SGS1-26A (Glider) C-FVOL
GRAND VALLEY, ONTARIO
28 JUNE 1987

REPORT NUMBER: 87-O/70051 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1730 EDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	35	35
LAST 90 DAYS	12	12

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot was attempting to land the glider on runway 08. At about 20 feet above ground level (agl), she initiated an overshoot to the left. In the steep turn, the glider's left wing tip touched the ground. The turn continued at low airspeed in a nose-high attitude, and the left wing tip struck the ground again. The glider tipped onto its nose and pivoted 180 degrees, coming to rest in an upright position 25 feet from the left side of the runway.

The glider was landing downwind on a well-maintained, privately licensed grass runway. The wind was from 270 degrees at about 15 knots. There were no pre-impact malfunctions or failures found, and the glider's weight and centre of gravity were within the prescribed limits.

The glider was under tow when it departed 15 minutes earlier from runway 26 and climbed to 2,000 feet agl prior to being released. The pilot soon found that the lift conditions were diminishing and, approximately two miles west of the field at less than 1,000 feet agl, she turned back to land. The pilot decided not to carry out a complete circuit as the glider's rate of descent was increasing, and it appeared that there would be insufficient altitude to land into wind on runway 26.

The glider was in position for a high, straight-in approach to land downwind on runway 08. While over the runway threshold, the pilot carried out a side-slip manoeuvre to lose excess altitude; the spring-loaded spoilers were briefly deployed at this time to increase the rate of descent. About three quarters of the way down the runway, the glider was still too high, with an airspeed of 60 mph. The pilot decided to overshoot, and a 180-degree turn was attempted in order to land in the opposite direction; however, the glider was so low that the left wing tip momentarily struck the ground. At this point, directional control was lost as the airspeed decreased, and the glider began to mush towards the ground. The left wing tip then struck the ground again, and the glider pitched nose-down and crashed.

The pilot was unable to compensate for the wind conditions on landing, and the glider crashed during the attempted overshoot.

FINDINGS:

Cause Related:

1. The pilot attempted to land the glider with a 15-knot tail wind, resulting in an unplanned overshoot.

2. The glider's left wing tip struck the ground twice while in the left turn, resulting in a rapid decrease in airspeed and a loss of directional control.

Other:
-Nil-

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COLLISION BETWEEN:
GROB FLUGZEUGBAU G102 ASTIR C-GRLB
AND SCHWEIZER SDS 2-33A C-GWCV
STARBUCK, MANITOBA
29 JUNE 1987

REPORT NUMBER: 87-C70801 (Accident)
LOCAL TIME: 1817 CDT
INFORMATION SOURCE: Field Investigation

G102 ASTIR C-GRLB

OPERATION: Private Recreational
DAMAGE: Destroyed
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	866	170
LAST 90 DAYS	20	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	1	-	-
PASSENGERS	-	-	-

SCHWEIZER SGS 2-331

OPERATOR: Winnipeg Gliding Club
OPERATION: Flying Training
DAMAGE: Substantial
PILOT LICENCE: Student

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	15	14
LAST 90 DAYS	3	3

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

CITABRIA (Tow plane) C-GVAI

OPERATOR: Winnipeg Gliding Club
OPERATION: Flying Training
DAMAGE: None
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	300	300
LAST 90 DAYS	12	12

HISTORY OF THE FLIGHT:

At 1457 central daylight time (CDT), a G102 Astir high-performance glider was towed from the Starbuck glider port for a local flight. About three hours later, the Astir glider was "thermalling" in a left-hand pattern about one-half mile southwest of the glider port. At 1810 CDT, a Schweizer 2-33A trainer, with a student pilot at the controls, was towed from runway 30 for a local solo flight. The tow plane turned to the right after take-off, then commenced a shallow turn to the left. After turning through 180 degrees, the tow plane pilot saw the Astir glider to the east of his position, at a higher altitude. The tow plane pilot continued the turn, and, as he rolled out on a northerly heading, he saw the Astir glider pass close on his right side. Immediately thereafter, the tow plane entered an uncommanded dive that progressed beyond the vertical. The pilot was able to recover from the dive and land safely at the glider port. The tow plane was not damaged.

The student pilot, in the Schweizer glider under tow, briefly saw the Astir glider, but he was concentrating on maintaining position behind the tow plane. The student then again saw the approaching glider and banked left in an attempt to avoid a collision. The gliders collided, and the towed glider entered a dive, but the student pilot was able to recover and land safely.

The Astir glider spun vertically, apparently out of control, until ground impact. The pilot was fatally injured.

PERTINENT INFORMATION:

The weather was suitable for the flights, with clear skies and visibilities in excess of 15 miles. The sun's position was in the west.

An examination of the Astir wreckage did not reveal any pre-collision unserviceabilities or control malfunctions. Five feet of the right wing and the outboard section of the right aileron had broken off during the collision and were located in a field south of the wreckage site. The elevators and rudder were intact. The plexiglass canopy had shattered in flight.

The Schweizer glider's right horizontal stabilizer and elevator were missing, and the right wing was damaged. The tow rope broke when the student pilot took recovery action.

Prior to the collision, the Astir glider was observed to be in a steep left turn passing through a westerly, into-sun heading. The steep turn is consistent with attempts to "thermal." A thermal is a rising current of heated air used by gliders to gain height. In most instances, the glider must be in a continuous steep turn to remain within the confines of the column of rising air. The Astir glider was equipped with a visual and aural variometer to assist the pilot in determining where a thermal is located.

The normal tow procedure is to climb to 300 feet above ground level (agl) on runway heading, then execute a gentle turn to 45 degrees off the runway, heading into wind, and continue the climb to 1,000 feet agl. The tow plane then turns 135 degrees in the opposite direction to return and cross the runway extended centre line at 1,700 feet agl. The tow plane then turns towards the airfield, and the glider is released at 2,000 feet agl.

The tow pattern flown on this flight was further to the south than on previous flights that day because of better gliding conditions. After take-off, the tow plane turned to the north, then entered a shallow turn to the left. When the tow plane was on a southerly heading at about 1,000 feet agl, the pilot noticed the Astir glider in a left turn to the east and at a higher altitude. The tow plane pilot continued the turn and, when on a northerly heading, saw the Astir glider at the same altitude, close by, still in a left turn. After the glider passed from view, the tow plane pilot looked in his mirror and saw debris in the air just prior to his aircraft entering the uncontrolled dive.

The Astir pilot had flown that morning and, on this flight, had been airborne for 3 hours and 20 minutes. He was an experienced glider pilot, with a cautious and safe approach to gliding. There was no evidence to indicate that he was incapacitated prior to the collision.

The tow plane and the Astir glider were equipped with two-way radios, but they were not being used. The Schweizer was not equipped with a radio.

ANALYSIS:

When the tow plane pilot saw the Astir glider above and to the east of his position, he assumed that, by the time he completed his turn to the north, there would be ample vertical separation from the other glider. However, as the tow pilot completed the turn, the glider was level with the aircraft and turning left towards the towed glider. The Astir glider continued in the steep turn until the right wing struck the towed glider.

It could not be determined if the pilot of the Astir glider saw either the tow plane or the towed glider prior to the collision. It is possible that the pilot's attention was directed to the variometer instrument in order to ascertain the thermal conditions or that, as the glider turned westerly, the sun restricted the pilot's vision.

Although the Astir glider lost five feet of the right wing and a portion of the right aileron, the rudder and elevators were still intact, and the pilot should have been able to initiate some recovery action. The fact that he did not and the fact that the canopy was shattered in flight suggest that the pilot was incapacitated by the forces of the collision.

It is possible that the collision could have been avoided if procedures had been in place to use the radios to allow an exchange of position and intention information.

It was concluded that the tow plane pilot and the pilot of the Astir glider failed to maintain continuous visual contact while close to one another, and they did not maintain adequate separation.

CONCLUSIONS:

Findings:
1. The Astir glider struck the towed glider while in a steep left turn, heading into sun.

2. The pilot of the Astir glider did not see the tow plane or the towed glider in time to avoid a collision.

3. The tow plane pilot did not maintain continuous visual contact with the nearby glider.

4. The onboard radios were not used.

Causes:
The pilot of the tow plane and the pilot of the Astir glider did not maintain continuous visual contact with one another.

SAFETY ACTION:

Action Taken:
The Winnipeg Gliding Club has placed greater emphasis on the need to "see and be seen" and is making the following changes to its operation:

A) Installing wing tip strobe lights on the tow planes for use at all times;

B) Implementing a number of radio procedures which will make all pilots more aware of the presence and movement of aircraft;

C) Implementing zoned towing areas; and

D) Installing new calibrated wear links on the tow ropes.

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EVANS VP1 VOLKSPLANE (Amateur-built)
C-GXSG
BEAVER RIVER, SASKATCHEWAN 1 mi N
05 JULY 1987

REPORT NUMBER: 87-C70052 (Accident)
INFORMATION SOURCE: Office Investigation
LOCAL TIME: 0930 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	88	6
LAST 90 DAYS	25	6

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot took off and was climbing away from a private airstrip at Cherry Grove for a short visual flight rules (VFR) flight to St. Paul, Alberta. Although the take-off seemed normal, the aircraft climbed very slowly. When the aircraft was at an altitude of about 1,400 feet above ground level (agl), the pilot decided to return to the airstrip and attempt to establish the cause of the aircraft's poor climb performance. While in the turn, the propeller rpm decreased rapidly from 3000 to 2000, and smoke was seen coming from the area of the propeller shaft. The pilot closed the throttle and, with the engine at idle, selected a field for a forced landing. As the aircraft neared the field, the pilot saw that a tractor and mower obstructed the selected landing area; so she landed the aircraft in an adjacent field of uncut hay. After touchdown and a short landing roll, the aircraft nosed over.

After the accident, the engine was disassembled, and it was found that the number one piston showed evidence of galling and was partially seized in its bore. The cylinder sleeve showed signs of severe heating. The location of the carburettor heat box and an air intake hose prevented sufficient airflow to adequately cool the cylinder, and, as a result, the cylinder overheated.

The partial seizure of the number one piston in its bore reduced engine power to the propeller and resulted in the forced landing.

CONCLUSIONS:

Findings:

1. The number one cylinder was not cooled adequately due to obstruction of cooling airflow by an air intake hose and the carburettor heat box.

2. The number one cylinder partially seized, resulting in decreased engine power, and the aircraft could not maintain flight.

3. The aircraft nosed over on landing because the landing area was not suitable.

Causes:
The number one cylinder partially seized in its bore because of inadequate cooling.

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NORTHERN LIGHTS AVIATION
SPECTRUM BEAVER (Ultralight) C-IERM
DAWSON CITY, YUKON 1 mi NW
09 JULY 1987

BRIEF NUMBER: 87-W75004 (Accident)
LOCAL TIME: 2300 YDT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Commercial Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	75	75
LAST 90 DAYS	50	50

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	1

REPORTED CIRCUMSTANCES:

The ultralight pilot was providing a demonstration flight to a prospective customer of the flying school. While in cruise flight, the pilot throttled back to demonstrate the glide capability of the aircraft. The engine quit and could not be restarted. A forced landing was carried out on a rocky island in the Klondike River, resulting in damage to the landing gear. The pilot indicated that the idle speed screw on the carburettor had backed out, allowing the engine rpm to drop to a level where it would not sustain an idle.

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BEAVER (Ultralight) C-IDOI
PITT RIVER, BRITISH COLUMBIA
14 JULY 1987

BRIEF NUMBER: 87-P75005 (Accident)
LOCAL TIME: 1930 PDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	N/A	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

As the float-equipped ultralight was becoming airborne from the river, a gust of wind lifted the right wing. The left wing tip touched the water, and the ultralight swung to the left. The left float was torn off, and the fuselage was bent. The pilot escaped uninjured.

* * * * *

SYLVAIRE BUSHMASTER II (Ultralight) C-IDRA
LONDON, ONTARIO 8 mi N
15 JULY 1987

BRIEF NUMBER: 87-O/75004 (Accident)
LOCAL TIME: 0820 EDT
OPERATION: Private Aerial Spray
DAMAGE: Substantial
PILOT LICENCE: Private

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	85	15
LAST 90 DAYS	8	8

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was pulling up over a tree at the completion of a spray run when the engine lost power. The aircraft did not gain sufficient altitude to clear the tree, and the spray boom struck the top of the tree. The aircraft then landed out of control and was substantially damaged.

The flat, rectangular design of the fuel tank, with the centre fuel pick-up, allowed air to enter the fuel system when the fuel ran to the corner of the tank during the steep climbing turn. The engine failed because of fuel starvation.

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AVIATION NORMAND DUBE ND 23
AERO CRUISER (Ultralight) C-IITA
MASCOUCHE, QUÉBEC
16 JULY 1987

REPORT NUMBER: 87-Q75005 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1730 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: None

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	13	2
LAST 90 DAYS	2	2

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	1	-

SUMMARY:

The pilot had just bought the ultralight aircraft and was making his first flight on this type of aircraft, with one passenger on board. After take-off, at an altitude of about 1,000 feet above ground level (agl), the pilot reduced engine power to a cruise setting. He had difficulty maintaining altitude, and the aircraft descended gradually until it was at the same height as a high-tension power line ahead. The pilot increased power and pulled back on the control column to clear the power line. After passing over the power line, the aircraft continued to climb and its speed decreased. The aircraft then turned to the right and began to spin toward the ground. Approximately 50 feet agl, the aircraft recovered and climbed with a very high nose-up attitude before again turning to the right and spinning toward the ground. The aircraft climbed a third time before turning over once again, then plunged toward the ground and crashed into a sandpit. The aircraft was heavily damaged, and the two occupants were seriously injured.

The weather was layers of broken clouds at 4,500 feet and 27,000 feet, visibility 45 miles, wind 280 degrees at 10 knots, temperature 21 degrees Celsius, and dew point nine degrees Celsius.

The pilot did not hold a pilot licence. Air Regulations stipulate that carrying passengers on board an ultralight aeroplane is prohibited; two-place aeroplanes are to be used exclusively for training with a flight instructor. When the pilot tested the aeroplane for the first time, accompanied by the builder, the latter noted that the pilot had difficulty controlling the aeroplane and had suggested to him that he take training with a qualified flight instructor.

No pre-crash structural or mechanical malfunction was detected. After the accident, the engine was tested at various speeds, and it ran satisfactorily. Examination of the wreckage revealed that the aircraft had crashed into the ground at a relatively low speed. The aircraft was not equipped with a stall warning, but this equipment is not required for this type of aircraft.

On take-off, the weight of the aircraft was 22 pounds over the maximum allowable gross weight.

When the pilot increased the engine power to maximum and pulled back on the control column to clear the power line, the ultralight aeroplane stalled and began to spin to the right. The pilot, because he did not have enough experience, training, or necessary knowledge, was unable to regain control of the aircraft.

FINDINGS:

Cause Related:
1. The pilot had neither the training nor the necessary knowledge to fly an ultralight aeroplane.

2. After flying over the power line, the aircraft stalled and began to spin to the right, and the pilot was unable to regain control of the aircraft.

Other:
1. The pilot did not hold a pilot licence.

2. The aircraft was 22 pounds over the maximum allowable gross weight.

3. The aircraft was not equipped with a stall warning; this equipment is not required for this type of aircraft.

4. The pilot was carrying a passenger. Air Regulations stipulate that carrying passengers on board ultralight aircraft is prohibited.

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SPECTRUM RX550 BEAVER (Ultralight) C-IFEF
HIGH PRAIRIE, ALBERTA 10 mi N
17 JULY 1987

BRIEF NUMBER: 87-W75005 (Accident)
LOCAL TIME: 1930 MDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Private Ultralight

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	47	N/A
LAST 90 DAYS	N/A	N/A

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was flying the aircraft at low altitude over a hay field to assess the field's suitability for landing. He climbed steeply to avoid buildings and rising terrain but did not maintain flying speed. The aircraft stalled and crashed into a corral.

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SPECTRUM BEAVER RX550 (Ultralight) C-IHZW
ST-LAMBERT-DE-LÉVIS AIRPORT, QUÉBEC
17 JULY 1987

BRIEF NUMBER: 87-Q75004 (Accident)
LOCAL TIME: 0930 EDT
OPERATION: Flying Club Training
DAMAGE: Substantial
PILOT LICENCE: None

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	9	9
LAST 90 DAYS	9	9

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The student pilot had been authorized to make her first solo flight. The winds were blowing gently from the right, at a speed of five to eight knots. After the take-off, the student pilot let the aircraft drift in the wind, and the aircraft headed toward a wooded area along the runway. When the student pilot noticed the 30- to 40-foot high trees, she pulled the nose of the ultralight up. The aircraft stalled above the trees and then crashed. The aircraft's fall was broken by the tree branches, and the student pilot exited uninjured.

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BENSEN B8M (Gyrocopter) C-FYZA
SUTTON, ONTARIO 6 mi S
18 JULY 1987

REPORT NUMBER: 87-O/70055 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1340 EDT
OPERATION: Private Recreational
DAMAGE: Substantial
PILOT LICENCE: Student Permit

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	67	7
LAST 90 DAYS	7	7

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	1	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The pilot had flown several passes over the airstrip. During the climb-out after a low approach and overshoot, he was not satisfied with the climb performance of the gyrocopter. While the aircraft was returning to the airstrip for a landing, the power output of the engine (Volkswagen) seemed to decrease, and the pilot landed the gyrocopter on a field of a sod farm. After the landing, the engine appeared to be running satisfactorily. The pilot then made three attempts to take off; on the third attempt, the aircraft became airborne briefly and settled back onto the ground. On touchdown, the nosewheel dug into the sod, and the gyrocopter nosed over.

The take-off attempts were made in an easterly direction. While there is no record of the wind velocity at the airstrip, the wind recorded at four airports surrounding the strip was from a westerly direction at 5 to 10 knots.

The airspeed reached during the downwind take-off run was insufficient for the rotor to obtain the required rpm for sustained flight. As a result, the aircraft settled back onto the ground.

CONCLUSIONS:

Findings:
1. The pilot attempted a downwind take-off.
2. During the take-off run, the rotor did not reach sufficient rpm for sustained flight.

Causes:
As a result of the downwind take-off, the rotor rpm was too low for sustained flight.

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AIR CADET LEAGUE OF CANADA
SCHWEIZER SGS2-33A (Glider) C-GCLI
DEBERT, NOVA SCOTIA
18 JULY 1987

REPORT NUMBER: 87-A70023 (Accident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 1700 ADT
OPERATION: Specialty Flying Training
DAMAGE: Substantial
PILOT LICENCE: Glider

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	305	230
LAST 90 DAYS	20	20

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	2	-
PASSENGERS	-	-	-

SUMMARY REPORT:

The instructor and student were practising emergency launch procedures in a 15- to 20- knot headwind. During three previous launches, they had practised simulated cable breaks, with straight-ahead landings. On the fourth launch, the instructor had arranged with the tow vehicle operator to simulate a tow vehicle engine failure. When the glider reached an altitude of approximately 400 feet above ground level (agl), which was the pre-arranged altitude, the tow vehicle driver began to decelerate. The student, who was flying the glider, recognized the decreasing airspeed, lowered the nose of the glider, and gave the "too slow" signal by rocking the wings. The tow vehicle driver, as briefed, did not respond to the signal and continued to decelerate. The instructor then took control of the glider to demonstrate a more pronounced "too slow" signal, then returned control to the student, and awaited his next action.

The student continued straight and level on the tow for about 5 to 10 seconds, waiting for the tow vehicle to accelerate; the instructor knew that this would not happen, and he pulled the tow release. The student then lowered the nose, extended fullspoilers, and started to make "S" turns in preparation for a landing straight ahead. At an altitude of 300 to 350 feet above ground level (agl) and with approximately 1,000 feet of runway remaining, the instructor took control to demonstrate a 360-degree circling approach to land.

After turning the glider right through 180 degrees, the instructor noted extensive drift and high ground speed caused by the wind and briefly returned to a nearly wings-level attitude while considering a downwind landing; he then decided against this and, at 100 to 150 feet agl, started the final 180-degree turn to the runway heading. The last 90 degrees of this turn was flown in a nose-down attitude and at an increasingly greater angle of bank. Just before the glider struck the ground, the instructor made an unsuccessful attempt to arrest the descent with elevator. The glider struck the runway while still in the final turn, in an attitude of approximately 70 degrees right-wing-down and 60 degrees nose-down; the spoilers remained in the fully extended position until the impact. The duration of the flight was 50 to 60 seconds.

The student had been briefed about the emergency procedures, but he had not been briefed specifically about this launch; therefore, the instructor was not able to anticipate what action the student would take. When he saw that the student was going to try to land ahead on the remaining runway, he assessed that there was insufficient distance to land and stop without running off the end. The Air Cadet League's Standard Operating Procedures call for a minimum altitude of 500 feet agl before attempting a 360-degree turn; however, faced with the possibility of landing long and damaging the glider, the instructor decided to try a low-level turn. He did not realize that the student had deployed the spoilers, nor did he recognize that they were deployed from the way in which the glider was flying. With the spoilers deployed, a successful 360-degree turn at this altitude was not possible. As the altitude decreased, the instructor continued to bank the glider more steeply to try to complete the turn.

At any time during the turn, the instructor could have levelled the wings and landed straight ahead; however, this would have meant possibly damaging the glider during a downwind or cross-wind off-runway landing. Rather than attempt an off-runway landing, the instructor tried to complete the turn and flew the glider into a spiral dive from which it was not possible to recover.

CONCLUSIONS:

Findings:

1. During the simulated tow vehicle engine failure, the instructor was not able to anticipate the actions of the student because no specific pre-briefing had been completed.

2. The delay in taking action during the simulated emergency resulted in the glider being in a position where there was a possibility of overrunning the end of the runway if a straight-ahead landing was attempted.

3. The instructor started a 360-degree turn at an altitude which was below the minimum altitude required in the Air Cadet League Standard Operating Procedures. At this altitude, it was not possible to execute a 360-degree turn with the spoilers fully deployed.

4. The instructor flew the glider into a hazardous condition of flight because he wished to avoid possible damage to the glider in an off-runway landing.

5. The instructor did not recognize that the spoilers were fully deployed.

6. In his attempt to return to the airstrip, the instructor continuously increased the angle of bank, causing the glider to enter a spiral dive from which recovery before ground impact was not possible.

Causes:

The instructor attempted a 360-degree turn at low altitude with spoilers deployed.

SAFETY ACTION:

Action Taken:

Following two glider accidents in 1987, both involving the "too slow" signal (which requires lowering the glider's nose and rocking its wings at low altitude and airspeed), the Atlantic Region of Air Cadets Gliding Operations ceased using this signal. It was felt that this manoeuvre was not good airmanship and that the probability of salvaging a launch with the "too slow" signal would be extremely remote.

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CORNEAU XRMC (Ultralight) C-IBUZ
CHIBOUGAMAU, QUÉBEC
23 JULY 1987

BRIEF NUMBER: 87-Q75007 (Accident)
LOCAL TIME: 1600 EDT
OPERATION: Private Recreational
DAMAGE: Substantal
PILOT LICENCE: None

PILOT HOURS:	ALL TYPES	ON TYPE
TOTAL	150	150
LAST 90 DAYS	30	30

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	1
PASSENGERS	-	-	-

REPORTED CIRCUMSTANCES:

The pilot was making the initial flight in his ultralight aircraft after having replaced the motor. During a 35-degree turn, the master wing mast broke, relaxing the tension of the stays. Because of the change in the contour of the wing profile, the lift was reduced considerably. The aircraft went into a spin and crashed in the trees.

Examination of the master wing mast revealed that the instantaneous break was due to the stays being overtightened during assembly and to the increase in the wing load during the turn. The quality of the material used to manufacture the master wing mast met the aeronautical standards in effect for ultralight aircraft construction.

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Annex 1

List of Reports by Aircraft Manufacturer and Type

REPORT BY AIRCRAFT MANUFACTURER AND TYPE

MANUFACTURER	TYPE	REPORT NUMBER	PAGE
AERO CRUISE	R	Q75005	217
AERONCA	7	C70019	153
		C70046	132
		O70012	149
		O70037	160
		W70036	128
		W70041	135
	L-3	A70022	146
AEROSPATLE	A300B	O74097	17
AMER AVCO	AA1	C70026	118
BEAVER	RX550	P75005	216
		Q75003	205
		Q75004	218
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		W75005	218
BEAVER RX35		P75003	207
BEECH	18	P70036	34
		W70023	27
	23	P70018	106
	35	A74939	119
		C70018	109
		C70025	117
		P70010	98
		Q74053	117
	45	C70049	41
	55	O70040	118
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	99	O70014	24
BELL	204B	C70016	175
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	206	A70021	189
		C70031	182
		O70028	177
		O70038	180
		O70049	185
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BELLANCA	14-19	C74023	110
BENSEN	B8	O70031	197
	B8M	O70055	219
	GYRO	O70018	195
BIRDMAN	CHINOO	C75001	194
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BOEING (cont'd)		C74048	47
		P74052	20
	747100	A74921	1
	767200	A74070	23
		O74041	6
		O74110	18
CAMERON	A-140	W70031	203
CANADAIR	CL215	C74034	88
	CL600	O74917	1
CANAERO	TOUCP2	O75001	196
CESSNA	120	P70048	142
	140	O70027	107
	150	C70008	49
		C70054	62
		C70063	108
		O70019	101
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		O70029	108
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		O70022	55
		O70025	55
		P70032	57
		Q70005	50
		Q70009	56
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		W70042	134
	172	A70005	65
		A70013	79
		C70033	163
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		P70026	113
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CESSNA (cont'd)		W70902	112
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		C70055	171
		C70056	170
		O70034	111
		O70048	165
		P70013	102
		P70031	162
		P70051	143
		P70901	159
		Q70003	25
		W70017	102
		W70018	103
		W70040	167
	182	C70905	146
		C74069	124
		P70909	136
		P74058	123
		W70048	140
	185	A70006	68
		A70008	152
		A70012	160
		A70902	164
		C70013	151
		C70020	154
		O70015	150
		O70017	98
		O70021	151
		O70023	152
		O70032	109
		O70053	168
		P70021	156
		P70033	31
		P70045	168
		Q70004	99
		Q70016	162
		Q70017	85
		W70022	71
		W70025	154
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		W70043	40
		W70044	138
	210	O70902	133
		P70043	135
		W70029	29
	310	O70903	92
	402	P70029	80
	421	P70046	42
CHAMPION	7ECA	C70050	61
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		O70039	161
		P70009	66
		Q70028	169
CONSOLIDATD	PBY5A	A70010	172
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	CV580	O74043	64
		O74062	15
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		P70024	28
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	DHC3	A70009	27
		A74028	65
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DOUGLAS	DC3	C70022	73
	DC4	C70039	86
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DURAND MARK	5	Q70010	201
EIPPER	QKSILV	W75003	210
ENSTROM	F28A	O70042	191
ERCO	415	Q70024	136
FISHER	FP101	A75001	199
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GRUMMAN	G164	A70017	87
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	500	P70037	192
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		Q70006	175
K&S SA 102		P70019	198
KITTY HAWK		W70021	200
LAKE	LA4	C70023	158
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		Q70030	170
LE PELICAN		Q75002	206
LOCKHEED	1011	A74947	2
		Q74030	15
LUSCOMBE	8	O70035	110
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MARANDA	LOISIR	O70047	207
MAULE	M4	W70904	121
	M4R	P70011	97
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MAULE STROC	K	A70901	163
MITSUBISHI	MU2	P74039	69
		W74051	114
MOONEY	M20	Q70901	147
NOORDUYN	UC64	C70009	67
		P70902	82
NORMANDUBE	AEROCR	Q75001	195
OSPREY	2	A70018	210
PAZMANY PL-	4A	W70030	205
PEGASUS SLR	WG	P75002	202
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	PA18	C70021	155
		O70046	127
		P70039	166
		W70028	113
		W70034	129
		W70906	140
	PA20	C70007	96
	PA22CP	P70015	104
		P70050	143
	PA23AP	C70015	105
	PA24	A70904	144
	PA25	C70036	128
		O70044	84
	PA28	A70020	62
		A70024	64
		C70030	102
		C70032	120
		O70052	141
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		O74058	100

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	PA32	Q70018	125
	PA34	A74074	148
		C70010	67
		C70012	53
		C70094	61
		O70011	47
		P70030	79
		Q70027	145
	PA38	W74016	48
PITTS	S1	C70903	139
QUICKIE		C70045	211
	Q2	W70905	137
ROBERTSON B	1-RD	P75001	204
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ROCKWELL	100	P70016	105
	112	C70047	132
SAUNDERS	ST27	O74054	8
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		A70023	219
		W70020	199
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	S58T	C70042	184
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	IL86	A74916	9
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STEARMAN PT	-17	W70903	112
STINSON	108	P70905	149
SWEARINGEN	MERIVA	Q74034	26
SYLVAIRE BU	SHMR	O75004	217
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	87-04-26	W70021	200
	87-05-08	W70025	154
	87-05-11	W70026	72
	87-05-17	W70031	203
	87-05-22	W70029	29
	87-05-24	W70030	205
	87-05-25	W74051	114
	87-05-27	W75002	205
	87-06-01	W74053	19
	87-06-11	W70033	122
	87-06-12	W74055	32
	87-06-14	W70034	129
	87-06-14	W70036	128
	87-06-15	W70037	86
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	87-07-05	W70048	140
	87-07-08	H74001	44
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	87-04-04	P70013	102
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	87-05-28	P70030	79
	87-05-29	P70031	162
	87-06-01	P70032	57
	87-06-02	P74052	20
	87-06-04	P70902	82
	87-06-07	P75003	207
	87-06-07	W70904	121
	87-06-10	P70033	31
	87-06-11	P70034	32
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	87-06-27	P70043	135
	87-06-28	P70041	212
	87-06-30	P70909	136
	87-06-30	W70905	137
	87-07-02	P70047	138
	87-07-03	P70045	168
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	87-07-22	P70053	94
	87-07-22	P70905	149
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	87-04-11	C74019	176
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New Brunswick	87-04-25	A75001	199
	87-05-27	A70013	79
	87-06-06	A70014	83
	87-06-13	A70902	164
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	87-04-16	A70008	152
	87-04-20	A70009	27
	87-05-06	A70010	172
	87-05-25	A70012	160
	87-06-17	A70903	131
	87-06-22	A70019	89
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	87-03-25	A70007	50
	87-03-29	A74921	1
	87-05-09	A70011	203
	87-06-06	A74939	119
	87-06-07	A70901	163
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	87-07-08	A70020	62
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	87-03-11	C70009	67
	87-03-12	O74054	8
	87-03-16	O74058	100
	87-03-20	O74062	15
	87-03-21	O70018	195
	87-03-21	O70019	101
	87-03-23	O70020	49
	87-03-28	O75001	196
	87-03-31	C70011	25
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	87-04-15	O70024	105
	87-04-17	O70026	153
	87-04-17	O75002	197
	87-04-18	O70031	197
	87-04-20	O70027	107
	87-04-22	O70025	55
	87-04-24	O70028	177
	87-04-26	O70029	108
	87-04-26	O70030	201
	87-04-30	C70019	153
	87-05-06	O70032	109
	87-05-07	O74097	17
	87-05-08	C70021	155
	87-05-09	O70033	56
	87-05-10	O70034	111
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	87-06-24	O70050	90
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	87-07-06	O70052	141
	87-07-06	O74917	1
	87-07-09	O70053	168
	87-07-11	O70054	90
	87-07-12	O74142	91
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Saskatchewan	87-02-21	C70006	95
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	87-04-26	C70063	108
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	87-05-31	C70027	81
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	87-06-09	C70031	182
	87-06-13	C70034	33
	87-06-13	C70035	57
	87-06-13	C74069	124
	87-06-14	C70036	128
	87-06-14	C70037	208
	87-06-16	C70039	86
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	87-06-21	C70045	211
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